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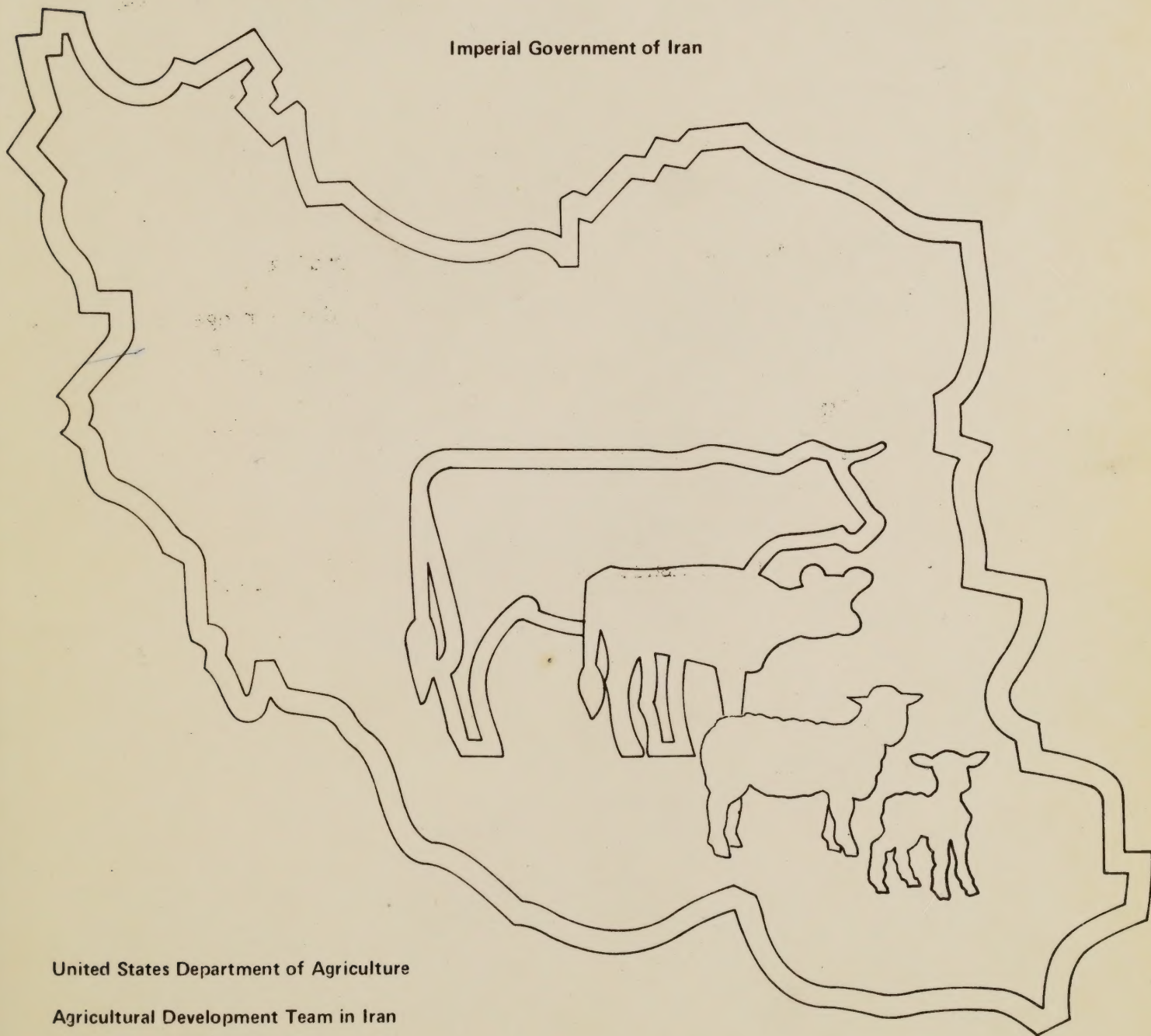
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Livestock Development

Volume 1

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES

Imperial Government of Iran



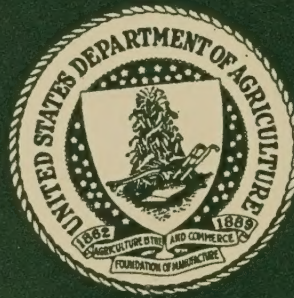
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Agricultural Development Team in Iran

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LIVESTOCK DEVELOPMENT IN IRAN

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FOREWORD

Iran's livestock industry has a potential to contribute a great deal more to Iran than it has for a number of years; the Government of Iran has recognized this. In 1972, the Minister of Agriculture and Natural Resources invited Dr. Louis Upchurch, former Administrator of the Economic Research Service of the United States Department of Agriculture, to make a brief study of the livestock industry and to recommend ways for improvement. Dr. Upchurch submitted his report in September 1972. Among his observations were:

1. The great potential capacity of the physical resources available for agriculture in Iran is impressive. These resources are not now being used in their full potential.
2. The large number of studies, surveys, plans, advisory commissions during past 20 years is astonishing. One can scarcely imagine a course of action that has not already been developed in previous reports.
3. If Iran is to produce more meat, it must first produce more livestock feed. Far too much of the present feed resource is used for maintenance of animals (often at a low level) and far too little captured as net output of animals. Any quick and substantial increase in the supply of feed must come from cropland.
4. The present marketing system for sheep and cattle does not encourage increased output. Slaughter markets must be revised to reflect consumer demand for quantity and quality of meat on one hand and producer supply on the other. There is a need to develop a "feeder" marketing system.
5. More meat production also requires improvement in the genetic capacity of animals. Past efforts have not yet shown much positive results. Quicker results might be obtained by a major campaign for culling the national sheep crop.
6. More meat production requires healthy animals.
7. Weeds are a serious problem. They reduce yields, waste water and labor.
8. Crop production in many areas of Iran is limited by wasteful and ineffective irrigation practices.
9. Many farmers, both large and small, seem to be operating with far too little capital to make their labor and land most productive.
10. Very poor dryland farming has encroached on grazing lands. A system of land classification should be perfected and a program initiated to restore to permanent cover all land not meeting minimum standards for slope, soil depth, climate and location.

Dr. Upchurch recommended three courses of action:

1. Substantially increase farm production of forage, especially alfalfa.
2. Revise the marketing system for slaughter animals and establish a marketing system for "feeder" animals.
3. Establish a "national sheep and goat culling program."

Further discussions between His Excellency Rouhani, Minister of Agriculture and Natural Resources, and Dr. Upchurch resulted in the recommendation that certain program and policy consultants be secured by the Ministry.

Correspondence between His Excellency Minister Rouhani and Secretary Butz, of the U.S. Department of Agriculture, resulted in two officials of the U.S.D.A. coming to Iran in March 1973 to work with Ministry officials in preparing a Letter of Understanding. The Letter of Understanding and related documents called for the U.S.D.A. to send seven experienced senior officers to Iran to work on agricultural policies and programs at the Minister, Deputy Minister, and Director-General levels in the Ministry of Agriculture and Natural Resources (MANR). Work of these officers, agreed upon by MANR and U.S.D.A. officials and generally following Dr. Upchurch's recommendation, focused on long-term livestock development.

The Letter of Understanding was approved by the Governments of Iran and the United States and signed by H.E. Minister Rouhani and Ambassador Helms on June 30, 1973. It called for assistance by the U.S.D.A. for a one-year period. Subsequently, the agreement was extended for a second year.

Most of the team members arrived in Iran by October 1973.^{1/} A General Terms of Reference document was prepared which outlined the work.^{2/} The Terms of Reference called for a mid-term report, which was presented to MANR in July, 1974.^{3/} Points covered in the mid-term report were preliminary.

1/ See Appendix A for a description of the team members and their work assignments.

2/ ERS/USDA. General Terms of Reference of the USDA Agricultural Development Team in Iran. Tehran, Iran. October 9, 1973.

3/ ERS/USDA Mid-term Report of USDA Agricultural Development Team in Iran: Livestock Development. Tehran, Iran, July, 1974.

Ministry and U.S.D.A. officials agreed that the major thrust of the U.S. team was to be livestock development. However, team members have been consulted on a number of other agricultural problems as well.

Deputy Minister Sepehri, during the first portion of the team's stay in Iran, asked the team to give special attention to organization and administration questions relating to the recommendations of Dr. Upchurch. Observations and suggestions on these questions are reflected in this report.

The team greatly appreciates the assistance it received in Iran. Special appreciation goes to Iranian counterparts for their cooperation and helpfulness.

I. INTRODUCTION

Iran was practically self-sufficient as recently as 1970 in meeting demand for livestock and livestock products. However, the situation changed rapidly and Iran now imports large amounts of these products. Furthermore, demand for livestock products over the next 20 years is expected to increase almost fourfold. The deficit between supply and demand will inevitably widen, especially for red meats, unless special attention is given to this sector. The team concentrated on ways to minimize this deficit. This report, then, is appropriately problem oriented.

The fact that Iran is trying many approaches toward solving its agricultural problems is a hopeful sign that many of them will eventually be solved. However, several attitudes must be overcome if adequate progress is to be made. Oversimplified, these include:

"We're already doing that"
"That is too complicated"
"That can't be be done"

Of the three, "We're already doing that" is probably the most deceptive, and perhaps most dangerous. Iran has hosted a large number of agricultural consultants over the past 20 years. They and Iranian officials recommended many programs. Some facets of these programs are underway. But, action so far is completely inadequate in scope and magnitude. Until those concerned can properly say "We're already doing that well enough and fast enough," they are misleading themselves and their country.

His Imperial Highness, the Shahanshah Aryamehr, listed a number of agricultural shortcomings in his 1961 book, Mission for My Country:^{1/}

1. We have shamefully misused our forests.
2. We have indiscriminately grazed and destroyed millions of young trees.
3. By improper cutting of firewood and making of charcoal we have denuded great areas.
4. We need to modernize our southern fishing fleets.

^{1/} Mohammad Reza Pahlavi, Mission for My Country, McGraw-Hill Publishers, N.Y. 1961.

5. We need land reform.
6. We need better training.
7. We need more credit for agriculture. Only a fraction of the credit needed is provided to small farmers.
8. We need to reduce erosion and salinization of our waters.
9. We need to introduce improved cropping and husbandry practices.
10. We need more farm tractors.
11. We need to control weeds.
12. We need better seed.
13. We need to expand our veterinary services.
14. We need to feed our livestock scientifically.
15. We need to introduce better varieties of livestock and poultry.
16. We need better processing and storage.
17. We need better roads between our villages and the cities.
18. We need to bring village life up to date.

Many of these needs persist. A significant reason so little progress has been made on such problems since 1961 lies in the complacency that seems to develop once a program is started. The statement that, "We're already doing that," seems to be enough to quiet virtually all criticisms or questions.

MANR officials must insist on realistic appraisals of the magnitudes of the tasks to be done. Top MANR officials should provide continuing support to those in charge of needed programs to assure that they are accomplished in the shortest time possible consistent with national priorities and resources.

There appears to be a strong consensus among MANR administrators and professional staff and expatriate consultants on problems of the Iranian livestock industry. Among these are:

- (1) Rangelands and other grazing areas are severely over-utilized with resulting semi-starvation of livestock and critical problems of range-watershed destruction and water and wind erosion;
- (2) village and small farm livestock are severely underfed, with resultant excessive use of feed for maintenance and low productivity of marketable products per unit of feed consumed;
- (3) far too many livestock in all types of production units are poorly managed as a result of shortages of capable managerial talent;
- (4) far too many cattle and sheep are genetically inferior and thus incapable of efficient production even in well-fed and well-managed units;
- (5) death losses and ill health result from malnutrition, poor sanitation, and stress of various kinds including especially migrations, diseases, parasites, and their interactions;
- (6) not all feeds available, especially a number of by-products, are efficiently used; and
- (7) the marketing system is not geared to adequately assist in developing the livestock industry.

This report indicates relative priorities where appropriate, and specifies time frames and quantities where feasible.

Recommendations in this report, if carried out, will contribute significantly to the goals of the Revised Fifth Development Plan (and subsequent plans), for increasing livestock and other agricultural production and for improving rural family incomes. The recommendations are also basically in line with the Government's policy of decentralization of authority and responsibility. In some cases, alternative solutions or attacks are indicated. In all cases, further refinement or some combination of the recommendations may be appropriate. Some problems discussed are much broader than the livestock sector, because various areas in agriculture are interrelated. Action in one such area affects others. Therefore, a number of our recommendations for livestock development are also applicable to other areas in the agricultural sector. Often the details can be developed only through meetings of ad hoc work groups specially formed for this purpose. Our recommendations and suggestions sometimes do not specifically call for the use of such work groups. However, we urge that MANR officials fully utilize this approach whenever applicable.

Oil revenues will likely provide needed funds for important and greatly stepped-up livestock and other agricultural programs throughout the next 20 years. But, even with ample money, the job ahead will require the utmost in diligence, judgment, skill, and resourcefulness. More well-trained employees in the livestock industry and in the Ministry will also be needed.

This report, the first of two volumes, outlines problems, causes, consequences of failure to resolve, opportunities and recommendations. It permits anyone who has special interests or time pressures to find and read quickly the highlights concerning particular areas. A second volume will treat each problem area in more detail.

II. PROBLEMS AND OPPORTUNITIES

Iran faces many problems and opportunities in its efforts to increase livestock production in the country. The problems involve a combination of physical and sociological factors which make resolution very difficult. However, they must be solved if Iran is to produce more livestock products in the future and to minimize damage caused by the excessive grazing of sheep and goats on its natural rangelands.

This report lists critical problems as the team sees them after almost one and a half years of intensive effort. No doubt other problems will come to some readers' minds, but we feel the report identifies most of the key problems facing Iran's livestock industry. If these are solved Iran will be in a much sounder position 10, 15 or 20 years from now. If they are not solved, Iran could (1) be importing, at a very large cost, the majority of its livestock products and/or (2) be consuming far less than desired by its citizens.

Problems and opportunities in this report center around seven major areas:

- A. Rangeland Management
- B. Forage and Feed Production
- C. Livestock Production
- D. Marketing
- E. Agricultural Research, Extension, and Education
- F. Coordination
- G. Administration

A. RANGELAND MANAGEMENT

Iran, although a leader in range management in the Middle East, has serious problems in its range management program. Over vast areas in Iran, range-watershed conditions are deteriorating, often rapidly and sometimes irreversibly. Overuse is the major cause. The nation is threatened with widespread and catastrophic erosion, floods, reservoir and stream bed siltation, and dust storms.

Early solution of these rangeland management problems is absolutely vital to the welfare of Iran and its people. A number of crash programs are essential to stop overgrazing and other undesirable uses of Iran's rangelands and to protect and rehabilitate these lands. A well-planned, broad-gauged, many-faceted, accelerated program is essential to manage and improve these rangelands so they will safely support maximum numbers of livestock. Even with such a program, the current intensity of rangeland use will need to be greatly reduced.

This section, highlighting critical rangeland management problems, includes a number of recommendations for solution or attack. It also suggests various specific steps and timing for carrying out these recommendations. In MANR's Forest and Range Organization, a number of programs already underway deal with these rangeland management problems. Efforts being made are often somewhat along the lines recommended and suggested. However, the plans are generally not detailed and firm enough and the on-the-ground progress is far too slow and limited in scope.

Critical problems in rangeland management revolve around: (1) grazing intensity, (2) identification of grazing lands, (3) cultivation of marginal lands, (4) fuel gathering, and (5) productivity of ranges.

1. Grazing Intensity

a. Problem:

Rangeland overgrazing generally causes poor to very poor range conditions and rapid deterioration.

b. Causes of problem:

- i. Rangelands are grazed by too many livestock.
- ii. Grazing begins too early and continues too long each season.
- iii. Village grazing areas are utilized by too many livestock and often year-long.
- iv. Range livestock water sources are too few and are distributed poorly. Livestock use is concentrated in cancer-like areas around these sources.
- v. Livestock driveways (particularly for migratory livestock) across rangelands damage the range by concentrating grazing and trampling.
- vi. Wildlife preserves and military reservations are established and/or operated on rangelands without adequate consideration of and alternate provisions for long-established livestock grazing needs.
- vii. Social attitudes of many rangeland grazers exaggerate the importance of having large numbers of livestock regardless of range conditions and animal weights.
- viii. Forest Guards are not providing needed protection against livestock overuse and other abuses of the nation's rangelands.

c. Consequences of failure to solve:

- i. Range-watershed lands will suffer very serious grazing damage. National problems from erosion, floods, reservoir and streambed siltation, and dust storms will mount.
- ii. Livestock grazing operations, vital to red-meat needs, will be significantly disrupted.

d. Recommended solution or attack:

- i. Stop overgrazing on rangelands, including areas around villages.
- ii. Provide range-watershed protection wherever needed.

- iii. Rehabilitate, as feasible, range-watershed areas which will not adequately recover naturally with protection.
 - iv. Provide adequate off-range feed or forage for range livestock which cannot utilize rangelands without overgrazing.
 - v. Get better distribution and availability of water for range livestock where feasible.
 - vi. Establish satisfactory arrangements to minimize livestock driveway use.
 - vii. Assure coordination in wildlife preserve and military reservation establishment and operation to minimize disruption and other damage relating to livestock use of rangelands.
 - viii. Work toward changing social attitudes of rangeland users who exaggerate the importance of having large numbers of livestock regardless of range conditions and animal weights.
 - ix. Provide Range Guard services adequate to assure range protection. Prosecute all willful violations.
- e. Action underway or planned:
- i. Considering the numbers and experience of Range Management Bureau and Watershed Management Bureau personnel in Tehran and the Ostans, highly commendable progress is being made, on limited areas, in stopping overgrazing and in range-watershed protection and rehabilitation activities. However, progress is far too limited and slow.
 - ii. A number of potentially significant actions to complete these programs more quickly nation-wide are being seriously considered in the Range Management Bureau and Watershed Management Bureau. Firm, detailed, specific plans and action programs are needed.
- f. Suggested steps and timing for carrying out recommendations:
- i. Develop and carry out firm, detailed, specific action plans for a crash program to stop overgrazing on all rangelands, including areas around villages. Develop these plans within one month. Initiate stepped-up action within three months. Complete program within three years.

- ii. In order to provide adequate range-watershed protection, wherever needed:
 - * Develop an effective approach, within three months, for notifying livestock range users, including villagers, about the need for protecting range-watershed areas, protection measures to be established, and actions to be taken to enforce protection.
 - * Assign and train Extension Service (or other) employees, within six months, to handle notifications. Complete the notification project within three months, thereafter.
 - * Assign and train Range Guards, by the time of completion of the notification project, to handle related enforcement. Thereafter, have them carry on the enforcement job, with full support at higher Government levels, as violations are noted. Prosecute all willful violations.
- iii. Develop and carry out firm, detailed, specific action plans for a crash program to rehabilitate, as feasible, those range-watershed areas which will not adequately recover naturally with protection. Develop the plans within six months, initiate stepped-up action within one year, and complete the program within ten years or sooner.
- iv. Develop and provide adequate off-range feed or forage (alfalfa, etc.) for range livestock which cannot utilize rangelands without overgrazing by taking related actions called for in this report's Feed and Forage Production section, Livestock Production section, and Livestock and Feed Marketing section.
- v. Get better distribution and availability of water for range livestock, where feasible, by taking aggressive action to:
 - * Explore and, as feasible, exploit Iran's weather modification (cloud seeding) possibilities. Complete the initial studies within two years. Initiate the subsequent action program, if and as appropriate, within one year following studies. Continue to pursue the studies and action program aggressively.
 - * Explore other potentially feasible ways of substantially increasing and otherwise improving water supplies for range livestock (including guzzler-type installations, horizontal wells, pumping, and water-hauling). Complete the initial feasibility studies within two years. Complete the subsequent action program in ten years or sooner.

- vi. Establish satisfactory arrangements to minimize livestock driveway use (particularly including that by migratory livestock) by taking aggressive action to:
- * Improve or provide road transportation systems adequate to permit driveway closure or reduced use, as appropriate. Investigate road needs, beginning within one month and determining major initial needs within one year. Finish this improvement study within two years. Complete all road construction and improvement projects in ten years or sooner.
 - * Provide help with trucking and related feeding and watering of livestock where practical between summer ranges and winter ranges. (Provision of adequate Government-financed trucks, drivers, feed, and water might be preferable to providing subsidies or other incentives directly to livestock operators to cover the costs of such services and facilities.) Determine the needs and practicalities within six months. Begin the program within one year and expand it to meet initial total needs (considering road adequacy) within three years, with further expansion as feasibilities increase.
- vii. Through appropriate inter-ministry and inter-bureau meetings, on-the-ground and in-the-office, identify all situations where past lack of coordination in wildlife preserve and military reservation establishment and operation is needlessly disrupting and/or otherwise damaging livestock use of rangelands. Determine and carry out appropriate actions to assure needed coordination in all such cases. Complete the identifications within one year. Initiate needed corrective actions within two years. Thereafter, assure needed coordination at all times.
- viii. Develop a training program designed to change social attitudes regarding the importance of livestock numbers within six months. Carry out the training in all villages and among tribal chiefs within one year.
- ix. Train Range Guards to provide adequate range protection within three months. Support their actions fully. Prosecute all willful violators.

2. Classification and Identification of Grazing Lands

a. Problem:

Classification and identification of grazing lands, including National Rangelands and village lands (by written descriptions and on-the-ground markings) is far from complete and progresses slowly.

b. Causes of problem:

- i. Many National Rangeland tracts and village lands used as grazing lands have illegally been developed or otherwise occupied and claimed for other uses by private individuals since the enactment of the National Land Reform laws.
- ii. Classification and identification of individual tracts of grazing land (as National Rangeland and village land) nation-wide is a complex job.
- iii. The responsible Land Survey and Distribution Bureau is inadequately funded and staffed to complete this classification and identification project in the short time required.
- iv. Political and other pressures from large numbers of private individuals, some of them prestigious, can create subtle and sometimes not-so-subtle influences resulting in the delayed classification, mis-classification, and/or mis-use of numerous grazing lands which properly should be classed as National Rangelands or village lands.

c. Consequences of failure to solve:

- i. Extensive and widely scattered tracts of National Rangelands and village lands used for grazing will remain unidentified for considerable periods, during which continuing and increasing illegal uses may well result in permanently improper classifications and uses of these lands.
- ii. The nation's already serious range-watershed deterioration will be further and needlessly accelerated.
- iii. Livestock management and red-meat production will be seriously and needlessly hampered.

d. Recommended solution or attack:

- i. Develop and carryout a crash program adequate to speedily complete the classification and identification of National Rangelands and village lands (by written description and on-the-ground boundary marking.)

ii. Assure that all identifications are correctly made.

e. Action underway or planned:

The Land Survey and Distribution Bureau is working on the classification and identification project to the extent its available manpower and funds permit. But, rate of progress is far too slow. The Forest and Range Organization may be preparing to find and eliminate factors which limit progress.

f. Suggested steps and timing for carrying out recommendation:

- i. Examine the existing program for classification and identification of grazing lands (National Rangelands and village lands.) Develop detailed, firm plans for an adequately stepped-up program within three months. Initiate the stepped-up action within six months, preferably much sooner. Complete the program within five years, or sooner.
- ii. Establish and initiate procedures, within three months, to withstand possible improper pressures for misclassification and/or mis-use.

3. Cultivation of Marginal Lands

a. Problem:

Marginal lands are those where slopes are steep, soils are shallow or erosive, and climate is arid or semi-arid. Many of them are former rangelands (including village lands) being cultivated for production of dryland cereals (mostly wheat and barley.) This cultivation is severely hampering livestock grazing and is causing very serious range-watershed deterioration and erosion.

b. Causes of problem:

- i. Because Iran needs more cereals, particularly wheat and barley, villagers and farmers are directly and indirectly encouraged to grow more, without adequate limitations on area selection.
- ii. No legislation defines marginal lands and adequately prohibits their cultivation.
- iii. Marginal lands identification by written definition, description, and on-the-ground boundary marking is lacking.

c. Consequences of failure to solve:

- i. Range-watershed lands will suffer very serious damage with resulting increased problems from nation-wide erosion, floods, reservoir and stream bed siltation, and dust storms.
- ii. Range livestock grazing operations will be significantly disrupted.
- iii. Labor, equipment, and seed grain will be wasted since values of crops on marginal lands often are inadequate to cover costs of labor, equipment, and supplies.

d. Recommended solution or attack:

- i. As necessary, develop and pass legislation defining and prohibiting cultivation of marginal lands which do not meet minimum standards for slope, soil depth and erosiveness, and climate. If desirable, include provisions for compensation and/or alternate employment in some situations for previous cultivators prevented from further farming on these lands.
- ii. Identify marginal lands to be removed or withheld from cultivation by written descriptions and by on-the-ground boundary marking.

- iii. Notify all villagers and farmers who have been or might be cultivating marginal lands that this is illegal. If appropriate, arrange compensation for previous cultivators and/or provide other employment for them.
 - iv. Have Range Guards enforce the prohibition (after its enactment) against cultivation. Support enforcement actions fully. Prosecute all willful violations.
 - v. Rehabilitate marginal lands involved, restoring a permanent cover of native rangeland vegetation, where feasible.
 - vi. Restore livestock grazing on marginal lands, to the extent that such use will not result in watershed damage.
- e. Action underway or planned:
- i. No specific action is known to be underway or planned.
 - ii. We understand that the Range Management Bureau is giving consideration to the development of an action program somewhat along the lines of that proposed above. Plans for converting marginal lands to rangelands are reportedly underway. However, a firm effective program still needs to be developed, initiated, and carried out.
- f. Suggested steps and timing for carrying out recommendations:
- i. As necessary, develop and present appropriate legislation defining and prohibiting use of marginal lands, within one month. Secure enactment within six months.
 - ii. Establish ground rules and a stepped-up time table for identification of marginal lands boundaries in the Range Management Bureau and Watershed Management Bureau within one month after legislation is enacted. Begin the stepped-up identification project within three months, and complete it within five years.
 - iii. Develop an effective approach, within one month, for notifying villages and farmers about the undesirability and illegality of marginal land cultivation. Provide for compensation of previous cultivators and/or provision of other employment for them, if appropriate, and for enforcement of the new law.
 - iv. Assign and train Extension Service (or other) employees within three months after enactment of the law to handle notifications. Complete the notification project within an additional three months.

- v. Assign and train Range Guards by the time of completion of the notification project to handle law enforcement. Thereafter, have them carry on the enforcement job with full support at higher Government levels as violations are noted. Prosecute all willful violations.
- vi. Develop an adequate marginal lands rehabilitation program within six months after enactment of legislation. Complete the rehabilitation work within ten years.
- vii. Determine, within one year, which marginal lands can be grazed without watershed damage (under appropriate controls). Initiate controlled grazing after completion of an approved area's rehabilitation.

4. Unauthorized Fuel Gathering

a. Problem:

Many villagers and others are, without authorization, removing ground-cover plants from range-watershed lands for fuel. In some places, manure for fuel is removed from range-watershed lands.

b. Causes of problem:

- i. Many villagers need and use such plants or manure as fuel for cooking and for heating of their homes, shops, and bath houses.
- ii. Some fuel gatherers sell the material gathered.
- iii. Existing laws and law enforcement activities are inadequate to prevent or discourage unauthorized fuel gathering.

c. Consequences of failure to solve:

- i. Range-watershed lands from which ground-cover plants are removed will suffer very serious damage with resulting nation-wide erosion, floods, reservoir and stream bed siltation, and dust storms.
- ii. Range-watershed lands from which manure is removed will lose an important source of fertilizer.
- iii. Livestock grazing will be disrupted.

d. Recommended solution or attack:

- i. Develop and carry out a system for supplying a satisfactory alternate fuel to all villages free of charge or at a nominal rate. Inform villagers that alternate fuel is available.
- ii. Amend existing legislation to prohibit removal of manure for fuel.
- iii. Notify all villagers that unauthorized fuel gathering is harmful, illegal, and will be punished.
- iv. Have Range Guards enforce prohibition against unauthorized fuel gathering.
- v. Establish a program for growing and authorized harvesting of shrubs and/or trees for fuel, with due caution about range-watershed damage.

e. Action underway or planned:

- i. Existing legislation, if enforced, is adequate to prevent unauthorized removal of ground-cover plants (but not manure) in fuel gathering.
- ii. The established Range Guards, if trained and supported, are able to enforce the law.
- iii. Some villages already use kerosene or other suitable fuels to meet local fuel needs.

f. Suggested steps and timing for carrying out recommendations:

- i. Establish satisfactory alternate sources of fuel (gas, kerosene, coal, and other) and adequate means for its transportation and distribution to all villagers. Begin consideration within one month. Complete all initial arrangements within six months.
- ii. Amend the existing law to prohibit removal of manure from range-watershed lands for fuel.
- iii. Assign and train Extension Service or other appropriate workers to carry out an educational program to assure that villagers are informed that unauthorized fuel gathering is harmful, illegal, and will result in punishment. Also assure that villagers are aware of the provision for supplying satisfactory alternate fuel. Begin training within one month after fuel supply arrangements are made. Complete the educational program within one year.
- iv. Assign and train Range Guards to handle related law enforcement activities. Begin training within one month after the educational program is carried out and complete this training within one month. Carry on enforcement work with full support at higher levels, as appropriate, thereafter. Prosecute all willful violations.
- v. Determine the extent (if any) to which shrub and/or tree species could be grown and harvested for fuel without range-watershed damage. Establish a sound fuel growing and harvesting program (under a permit system) for any such areas. Begin consideration of potential within six months. Complete all initial arrangements and initiate the program within one year.

5. Productivity of Rangelands

a. Problem:

Rangeland productivity falls short of potential.

b. Causes of problem:

- i. Rangelands are overgrazed and overused for other purposes such as dryland cereal production on marginal areas and unauthorized fuel gathering.
- ii. Current range management and improvement programs are inadequate to improve utilization and maximize productivity of rangelands within a reasonable time.

c. Consequences of failure to solve:

- i. The gap between red-meat production and consumption will widen.
- ii. Costly red-meat imports will continue upward.
- iii. The revised Five-Year Development Plan goal of becoming as self-sufficient as possible in the production of goods needed in Iran will become increasingly unattainable.
- iv. The opportunity to shift some grazing use from deteriorating and eroding rangelands to improved rangelands with excess capacity will be delayed or lost.

d. Recommended solution or attack:

- i. Complete range surveys and range management plans expeditiously, nation-wide.
- ii. Initiate early and sustained actions for carrying out range management plans. Utilize tribal range-livestock management skills, as appropriate.
- iii. Develop plans for a crash nation-wide range improvement program.
- iv. Step up the range improvement program as planned.
- v. Use resulting improved rangelands, to the extent feasible and appropriate, to reduce livestock pressures on deteriorating rangelands.

- vi. Step up range management research and its application to meet current and future needs in range management, utilization, and improvement.
 - vii. Assure that staffing and facilities are adequate to carry out accelerated range management, improvement, and research programs.
- e. Action underway or planned:
- i. Considering the numbers and experience of Range Management Bureau and Range Management Research Division personnel in Tehran and the Ostans, highly commendable progress is being made, on relatively limited areas, in the development of plans and programs for range management and improvement and related research. However, progress is too slow.
 - ii. Actions required to complete these plans and carry on these programs more quickly, nation-wide, are being considered in the Range Management Bureau and the Research Institute for Forests and Ranges.
- f. Suggested steps and timing for carrying out recommendations:
- i. Accelerate work on initial range management plans, consistently working with range users. Through range surveys, develop needed accurate information on livestock numbers; rangeland areas, types, locations, conditions, trends, capabilities, availability, and suitability; rangeland uses, existing and potential, by livestock, wildlife, and other users; and range utilization and carrying capacity. Complete all initial surveys or plans, nation-wide, within five years.
 - ii. As initial range management plans for individual areas are complete, promptly initiate and pursue actions needed to carry them out. Utilize tribal range-livestock management skills, as appropriate.
 - iii. Develop plans for a crash nation-wide range improvement program (including range seeding and planting with native and/or introduced species; control of range pests such as rodents, insects, disease, and noxious and poisonous plants; water developments for range livestock; and range-lands fertilizer application) where feasible and desirable within five years.
 - iv. Increase, within one year, the rate of action on the range improvement program. Continue it at a rate which will complete the program in 20 years or less.

- v. Assure that resulting improved rangelands are used, to the extent proper, feasible, and appropriate, on a continuing basis, to reduce livestock pressures on deteriorating rangelands.
- vi. Step up Iranian range management research to provide adequate and timely information to meet current and foreseeable range management, utilization, and improvement needs. With coordination of the Range Management Bureau and Range Management Research Division, determine such needs and institute within one year a detailed research program with a timetable designed to meet these needs. Carry out the stepped-up program as scheduled.
- vii. Assure that staffing and facilities are fully adequate in numbers and capabilities to carry out these range management improvement and research programs within three years.

B. FORAGE AND FEED PRODUCTION

Cropland agriculture in Iran must be re-oriented to produce more livestock feed if the country is to meet red-meat needs. Only by reducing pressure on rangelands is recovery possible, and only by producing more forage and feed on cropland can that pressure be reduced without sacrificing the range and village sheep and goat industry. The feed situation for livestock in Iran has reached a critical and unprecedented condition.

Each of the four problems in this section, if solved, can contribute significantly toward bringing about a balance between livestock numbers and forage and feed resources including rangelands with minimal disruption of the livestock industry and cropland agriculture. All proposed solutions, instituted as rapidly as manpower resources will permit, would help assure Iran's agricultural modernization.

The problems identified in this section are: (1) feed and forage supplies, (2) feed production on cultivated lands, (3) irrigation resources, and (4) utilization of by-product feeds.

1. Forage and Feed Supplies

a. Problem:

The livestock industry is short of feed and forage.

b. Causes of problem:

The range and village livestock industry has historically depended almost entirely on rangelands and has generally developed independent of croplands. Relatively recent increases in livestock numbers have seriously overpopulated rangelands. Cultivated croplands do not produce enough feed and forage for these additional animals.

c. Consequences of failure to solve:

The range and village livestock industry will be limited largely to what livestock can be produced from range and village grazing lands presently deteriorating under excessive grazing pressure.

d. Recommended solution or attack:

- i. Offer a guaranteed minimum price for forage produced.
- ii. Develop incentive or regulatory measures to insure that each livestock owner will produce or purchase and feed 0.2 ton of feed or forage (dry weight) per sheep unit owned.
- iii. Develop incentive or regulatory measures to insure that a specified percentage of all new irrigated lands will be sown to forage crops.
- iv. Trade irrigated lands for tribal livestock so tribesmen can meet feed production requirement.
- v. Provide adapted seeds and fertilizer for forage crops at discount prices.
- vi. Provide advice on growing forage crops.

e. Action underway or planned:

The Impact Program imports and distributes limited amounts of seeds and fertilizers needed for some forage crops at reduced prices. This program has not greatly increased forage production.

f. Suggested steps and timing for carrying out recommendations:

- i. Offer a minimum guaranteed price immediately.

- ii. Livestock owners should produce or purchase 0.2 ton dry forage per sheep unit owned during 1976, and feed during the winter of 1976-77, and each year thereafter.
- iii. A percentage of new irrigated land, specified by the MANR, is to be seeded to forage crops as rapidly as it is brought under cultivation.
- iv. A trade of new irrigated land should be made with the tribes for sheep or goats as rapidly as the land becomes available.
- v. The supply of high quality seeds of adapted forage crop species should be greatly increased as rapidly as possible, but in no event later than January 1976.
- vi. Advice on the production of forage crops should be disseminated among farmers as soon as people qualified to do it can be recruited, but in no event later than January 1976.

2. Production on Cultivated Land

a. Problem:

Cultivated land in Iran produces low yields per hectare. Also, most cropland is used to produce cereals rather than animal feed.

b. Causes of the problem:

Centuries old farming practices are still used widely in Iran.

c. Consequences of failure to solve:

Production from agricultural cropland will remain low. Standard of living of rural people will remain low. As Iran's population increases, and the standard of living of non-rural peoples increases, Iran will be forced to depend increasingly upon imports.

d. Recommended solution or attack:

- i. Increase yields per hectare of all crops, particularly wheat and barley, thus releasing more land to forage production.
- ii. Launch a massive education program with farmers which will promote: (a) maize and sorghum where water is ample, (b) use of fertilizers, (c) double cropping, and (d) studies of winter wheat production on dryland.
- iii. Increase the supply of agricultural credit.
- iv. Promote research on crop production.

e. Action underway or planned:

The Impact Program operates on a too restricted scale but does make some seed and fertilizer available at reduced prices.

f. Suggested steps and timing in carrying out recommendations:

- i. Rapidly organize a strong central extension office in each crop region and launch a massive farmer education program to improve adoption of agricultural technology. Make full use of radio and publications.
- ii. Begin at once the selection of men to be trained in all phases of agricultural extension.

g. Possible alternative solution or attack:

There is no long-term acceptable alternative to increasing yields. Soybean production could be greatly increased offering a substitution of vegetable for animal protein. However, this is not an acceptable alternative at present, but could be in the future when ranges have been improved and are producing at their full potential.

3. Irrigation Resources

a. Problem:

Irrigation water resources, a significant limiting factor in crop production, are not fully developed and are not efficiently utilized.

b. Causes of problem:

Ancient distribution systems are geared to small land holdings. Unlined canals and head-ditches are bordered with water-wasting vegetation. Irrigation practices are improper in both timing and amount. Facilities for water storage are inadequate.

c. Consequences of failure to solve:

Iran will fall short of her agricultural potential. Excessive imports or a lower standard of living for the people will result. Continued ruination of cropland will occur through excessive irrigation, rising water tables, and salinity.

d. Recommended solution or attack:

- i. Develop resources to extend irrigation.
- ii. Line all canals and head-ditches to prevent water loss by seepage and to vegetation along banks.
- iii. Gear water allocations to crop needs.
- iv. Restrict irrigation in areas where it raises the water table on lower-lying lands.
- v. Prevent excessively saline waters from entering the irrigation water supplies.
- vi. Increase research for new sources of water and its efficient use.

e. Action underway or planned:

Canal and head-ditch lining and ground water development are progressing in some areas, but should be accelerated. Water research is being conducted, but should be greatly increased.

f. Suggested steps and timing for carrying out recommendations:

- i. Storage structures or pumps and distribution systems should be extended as rapidly as possible to bring more land under irrigation. Conduct adequate feasibility studies promptly, including consideration of water availability, soils, competing demands for water, etc.

- ii. Every canal and head-ditch considered to be properly located should be scheduled for lining in the next four years. Structures whose location may be changed by future land leveling operations should be re-surveyed and scheduled for re-location and lining within the next 10 years.
- iii. A trial attempt should be made by the summer of 1976 to schedule water to farmers on the basis of their crop needs rather on shares of water owned. If this water-conserving measure is successful, it should be extended to the entire country.
- iv. MANR should begin at once a campaign to educate farmers on the most efficient use of irrigation water.
- v. Legislation should be enacted within three months to discourage excessive irrigation under conditions where the water table is raised on lower-lying land impairing it for crop production.
- vi. Immediate action should be taken to identify saline waters and devise means of keeping them from the irrigation supply.
- vii. Within three months, MANR should set up a committee consisting of two competent soil scientists, agronomists, and irrigation engineers to explore for new and unusual sources of water for crop production and other agricultural uses.

4. Utilization of By-product Feeds

a. Problem:

Many available by-product feeds in Iran are not being used to the best advantage.

b. Causes of problem:

- i. Livestock producers lack knowledge of the true feeding values of many feeds available as by-products of crop production. Effective demand for by-product feeds is thus lower than warranted by comparative feeding values.
- ii. A pricing system in some cases discourages the operators of processing plants from seeking domestic markets.
- iii. Historic utilization patterns developed before the demand for livestock products was so high in Iran.

c. Consequences of failure to solve:

- i. Iran will continue to be short of animal feeds and to import feed grains.
- ii. Iran will continue to export by-products of food manufacture, some of them at prices below their value as domestic livestock feed.
- iii. Some by-product feeds, notably sugar beet molasses and whole cottonseed, will continue to be used inefficiently or will be wasted.

d. Recommended solution or attack:

MANR should establish a study group to review the by-product situation with the aim to:

- i. Determine total current production and use of by-products having known or potential value as livestock feeds.
- ii. Determine sources and potential amounts of by-products with known or potential feeding value being wasted or not now being processed.
- iii. Determine sources and amounts of by-products with known or potential feeding value now being exported at prices below their probable value as feed in Iran.

- iv. Propose an over-all program to optimize use of by-products in Iran. The proposals should include, but not be limited to: pricing policies to encourage by-product use for feed; transport and distribution systems to get the material to livestock producers; educational programs to acquaint livestock producers with true feeding values; and, where considered necessary, suggested research programs to determine feeding value.

e. Action underway or planned:

Individual MANR units and members are known to be concerned with this problem. So far as is known, there is currently no unified program attacking it.

f. Suggested steps and timing for carrying out recommendations:

- i. Appoint the study group in one month.
- ii. Require the study group to submit a preliminary report four months after appointment and a final report four months later.
- iii. Implement recommendations of the study group immediately taking into account prior commitments of processing plants and other pertinent factors.

C. LIVESTOCK PRODUCTION

Iran has large livestock populations, high and increasing consumer demands for animal products, and limited supplies of feed-stuffs. Production per animal is low resulting in very low efficiency of use of feedstuffs.

This section focuses on ways to quickly (1) increase productivity of livestock per unit of feed eaten and (2) reduce the number of non-productive feed-consuming animals.

Efficient livestock production depends upon the integration of many steps in the production process. Failure at any one step greatly reduces or destroys efficiency in the entire process.

The problem of low efficiency can be approached in one of two ways: existing herds and flocks can be eliminated and replaced by new enterprises under new ownership; alternatively, productivity of existing herds and flocks can be transformed while maintaining the integrity of ownership patterns and the social structure. Both approaches are potentially useful in Iran and recommendations in this section have elements of both. However, emphasis is on increasing productivity of existing producers.

We focus on the critical problem of improving productivity of village and tribal herds and flocks. But, we do not imply that existing programs involving development of larger, specialized enterprises of the agri-business type, farm corporations, and production cooperatives should be discontinued or de-emphasized. Rather, the recommended programs will complement those already in progress.

Critical problems outlined in this section center around (1) livestock productivity and (2) draft animals and beasts of burden.

1. Livestock Productivity

a. Problem:

Productivity of village and tribal herds and flocks is very low.

b. Causes of problem:

- i. Too many animals for available feed supplies.
- ii. Failure to provide extra feed when pastures and ranges are short.
- iii. Lack of, or failure to use, adequate levels of protein, mineral, and vitamin supplements needed for balanced rations.
- iv. Low genetic potential for either milk or meat production.
- v. Poor control of animal diseases and parasites.

c. Consequences of failure to solve:

- i. Inordinately high percentages of feeds eaten are used for maintenance. In effect, half or more of the feeds eaten may be wasted as compared to possibilities with optimum nutrition of fewer animals.
- ii. Lower production of milk and meat by the nation with resulting need for imports.
- iii. Low incomes for livestock owners.
- iv. High prices of animal products to consumers or high costs of government subsidy programs.
- v. Continued destruction of grazing lands and watersheds through overgrazing.

d. Recommended solution or attack:

The key element for solution of this problem is adjusting forage consuming livestock numbers to fit feed supplies. Feed supplies are considered to include grazing from National Range Lands, village grazing lands, grazing from any other publicly owned land, grazing and harvested residues such as straw from croplands, harvested forages such as alfalfa hay or maize silage, and feed grains which can be grown in the area or purchased.

National Range Lands and village grazing lands are currently severely overstocked and increased supplies of harvested forages and feed grains can be produced only over a period of years. Thus, initial reduction in numbers of sheep, goats, cattle, and buffalo is vital. Dividing the available feed from ranges, pastures, and harvested sources among fewer animals will in itself go far to reduce death losses and increase reproductive rates.

Concurrently with reducing livestock numbers, measures should be taken to provide balanced rations, intensify measures to control diseases and parasites, and improve quality of livestock.

Details of programs to be used for reducing livestock numbers and improving rations, disease and parasite control methods, management procedures, and genetic quality can be developed only by joint consideration of both MANR and the Ministry of Cooperation and Rural Affairs (MCRA). Thus, the first step is to appoint a joint task force of the two ministries with instructions that the members develop a program within two months.

Several alternative procedures which this team believes merit serious consideration are presented here in summary form. More detailed discussion of each will be found in volume 2. The alternatives are not mutually exclusive. Features of each might be found most practical for Iran.

Alternative 1: Under a new unit of the Agricultural Extension Service, or a new independent organization if Agricultural Extension is not in a position to handle the program, train Animal Production Field Men and station them in villages and with tribal units with responsibility for (1) establishing quotas for ownership of livestock of each species for each owner, (2) issuing permits for ownership up to the quota level, (3) supervising the culling of flocks and herds, (4) arranging for the purchase of required supplementary feeds, (5) guiding breeding programs, and (6) cooperating with the Veterinary Organization in intensified animal disease prevention and control programs.

Alternative 2: By administrative action of MANR and MCRA and with full knowledge and support of the very highest levels of government require a reduction of 50 percent in numbers of females one year of age and over for sheep and goats and two years of age and over for cattle and buffalo in all herds and flocks dependent in whole or in part on grazing on National Range Lands, village lands, or other publicly owned areas. The 50 percent reduction is to be accomplished in the minimum possible time consistent with utilization of the carcasses of animals slaughtered in the reduction. In no case should more than five years be required.

An indemnity payment will be made December 1 each year for the first five years of the program equal to approximately half the value of a slaughter lamb, kid, or calf for each female of the corresponding species removed from the herd in the reduction program to that date. At the end of five years the indemnity payment program would be reviewed with the objective of gradually phasing it out or converting it to an incentive program over the next five years as productivity of herds and flocks improves.

Alternative 3: Same as Alternative 2 but with the additional requirement that in order to be eligible for the indemnity payment the owner must each year provide at least 200 Kg. (air-dry basis) of harvested feed per breeding ewe or nannie and one ton per breeding cow or buffalo and use it for winter feed or as a grazing supplement when required at other seasons.

e. Action underway or planned:

Certain phases of current Animal Husbandry Organization, Range Organization, and Extension Service programs are addressed to the problems of improving productivity of village and tribal livestock herds and flocks. However, they cover only a small fraction of the country and effectiveness has not been demonstrated by increases in production.

A program is being carried on by the Meat Organization to purchase sheep and goats for feedlot fattening to reduce pressure on range and village grazing lands and to increase total meat production. To date it has not been very effective and at best will fall far short of meeting total needs.

f. Suggested steps and timing for carrying out recommendations:

A joint task force of MANR and MCRA should be appointed immediately with instructions to have a recommended program developed and submitted to the two ministries in not more than two months.

The recommended program should be reviewed at high levels of government, modified as necessary, and adopted in not to exceed two months after submission.

Subsequent action schedules will depend upon details of the program adopted. Suggested schedules for Alternatives 1, 2 and 3 of this report are included in volume 2.

g. Possible alternative solution or attack:

Needed changes could conceivably be accomplished without coercion through an intensified program of extension education. However, it has yet to be demonstrated that educational programs can alone be an effective force with the present generation of Iranian small farmers and tribesmen. Even if ultimately successful, the time required would be greater than can be justified taking the critical nature of the problem into account.

The problem of low productivity of range, village, and farm livestock could be ignored and emphasis of the Ministry put on the establishment of a new Iranian livestock industry in the form of large commercial or agri-business type enterprises. If these were successful and expanded to the extent that they could provide Iran's needs for animal products, the village and tribal herds and flocks would presumably ultimately be squeezed out by economic forces.

For cattle, this philosophy seems implicit in FMC's projection of a 75 percent reduction in native cattle numbers by 1990. Even if this approach might ultimately be successful with cattle, it would be accompanied by unacceptably high levels of human suffering and poverty and by inordinately high levels of feed wastage through continued inefficient nutrient usage for many years during the adjustment period.

For sheep and goats, no one has yet demonstrated that intensive confinement or semi-confinement production systems can be economically viable under price relationships likely to be encountered in the foreseeable future. Thus, continued use of village and tribal grazing lands and crop residues are an absolute necessity if production levels are to increase. The projected program will not interfere with, and indeed is a highly desirable prelude to, future consolidation of production units for more efficiency. Regardless of ultimate organization form, we believe production units will continue to be based to a considerable extent on nutrients secured by grazing animals from ranges, pastures, and post-harvest crop residues.

2. Draft Animals and Beasts of Burden

a. Problem:

Iran has far more animals used for draft and as beasts of burden than necessary. There is, therefore, a great waste of critically needed feedstuffs.

b. Causes of problem:

- i. Iran is estimated to have a total population of animals used almost solely for draft and burden (horses, donkeys, mules, and camels) which require nutrients equal to those required to support 22 million sheep.
- ii. Large but unknown numbers of cattle and buffalo are maintained solely or partially for draft use.
- iii. With increased use of tractors and motorized transport, it is probable that more animals are maintained for draft and burden than needed.
- iv. Fundamental cause is the conservatism of farmers.

c. Consequences of failure to solve:

Feedstuffs urgently needed for production of meat, milk, and eggs will continue to be used nonproductively in feeding surplus beasts of burden and draft animals.

d. Recommended solution or attack:

The Ministry should appoint a small task force to make a critical study of needs for and of numbers and geographic distribution of beasts of burden and draft animals in Iran.

If numbers are found to be in excess of needs, programs for effecting reductions should be developed and recommended to the Ministry.

e. Action underway or planned:

None known.

f. Suggested steps and timing for carrying out recommendations:

- i. Appoint a task force in one month.
- ii. Task force to report within six months.
- iii. Implement task force recommendations in two to six months following submission of report, depending upon the nature of the recommendations.

D. MARKETING

Development of a market oriented livestock, meat, and livestock feed industry in Iran is essential if the animal protein production goals are to be approached. While significant development has already occurred, large increases in demand accompanying expanding consumer disposable income and government subsidies on meat have spurred meat consumption. This has created further stress on the young, already over-loaded system.

Large feedlot programs for cattle and sheep make formation of a feeder marketing system imperative if feedlots are to meet prescribed goals or even to operate efficiently. As demand for additional supplies of better quality meat grows and as production of livestock from ranges declines, the need for efficient marketing, processing, and transport of livestock feeds and feed grains will also grow. Marketing of young animals from range areas for feeding purposes also is needed to reduce overgrazing.

The MANR has an opportunity to establish a program to classify live animals according to their most efficient use and to develop standards for grades of slaughter and feeder livestock and carcasses reflecting consumer desires. These will allow the pricing system to discriminate between uses and qualities thereby tending to direct the allocation of production resources and production.

Large investment in marketing facilities may be beyond the capability of private investors. Regulation of the industry to insure fair treatment to all segments, including consumers, should be MANR's responsibility.

Critical problems covered in this marketing section are: (1) standards and grades for live animals, (2) standards and grades for carcasses, (3) feeder stock marketing system, (4) marketing education programs, (5) feed marketing system, (6) slaughter facilities, (7) cold storage, (8) retail meat distribution system, and (9) market information.

1. Standards and Grades for Live Animals

a. Problem:

There is no classification and grading system for live animals.

b. Causes of problem:

Production, selling, and buying of live animals have not, until recently, been oriented to market needs. Carcass value has received little consideration; in the absence of a feeding industry, almost all animals marketed were for slaughter, regardless of carcass quality or feeding potential. Recent development of a commercial livestock feeding industry has increased need for use classifications and quality grade standards for feeder and slaughter animals.

c. Consequences of failure to solve:

Without uniform specifications to guide the pricing system, the direction of production and the distribution of products cannot be performed efficiently. Large feedlots being formed will find it difficult to compete with slaughter buyers in some seasons and will not be able to obtain a uniform supply of feeders. They will also be competing with low grade carcasses on the selling end with no price incentive for their higher quality carcasses. Ultimate consequences could be empty feedlots and lower production of carcass meat, especially of more desired quality.

d. Recommended solution or attack:

- i. Establish a Livestock and Meat Standards Branch in the Meat Organization.
- ii. Send selected personnel to study the Meat Grading Program and the use of classes and grades for live animals and meat by the Livestock Market News of the U.S.D.A. Agricultural Marketing Service.
- iii. Develop classes and standards for live animals that will, as accurately as possible, reflect grades and grade standards for carcasses. These standards must be based on visible characteristics indicating desired carcass features. In the case of feeder animals, characteristics reflecting the animal's ability to develop in the feedlot must be defined.
- iv. Competent expatriate personnel qualified in meat and live animal grading will be needed in steps i and iii. U.S.D.A. experts are available.

e. Action underway or planned:

Efforts are being made to buy live slaughter animals on the basis of quality; but, an effective program is improbable without official, uniform standards. Some discussions on slaughter grade standards have occurred.

f. Suggested steps and timing for carrying out recommendations:

- i. Immediately select an interested, competent person to organize the Livestock and Meat Standards Section in the Meat Organization. He should select a nucleus of staff for a training program in U.S.D.A.
- ii. Within three months, arrange a training program with the U.S.D.A. Agricultural Marketing Service.
- iii. In the fourth and fifth months, complete travel and training and return to Iran to begin preparation of grade standards.
- iv. During the sixth, seventh, and eighth months, work with expatriate experts (FAO and U.S.D.A.) to develop grades and grade standards for slaughter and feeder livestock. Training program for official graders should begin.
- y. From the eighth month to the end of the year, the training program would be started in Tehran.
- vi. At the one-year mark, the program should be reviewed and a schedule prepared for further expansion. This would include regular training programs for new official graders in addition to refresher and coordination courses for experienced graders.

g. Possible alternative solution or attack:

The only workable alternative would be the establishment of a similar group in the UNDP Center for Agricultural Marketing Development in MCRA.

2. Standards and Grades for Carcasses

a. Problem:

There is no official, workable set of standards and grades for sheep, goat, and cattle carcasses.

b. Causes of problem:

The traditional market system has not required the formality of grade standards to aid in procurement and pricing of slaughter inputs nor to provide guidance to the distribution of meat. Inflexible price controls on meat at retail and the current deficit supply situation are important factors contributing to the problem.

c. Consequences of failure to solve:

Consumer desires are not met when no distinction is made for increased yield of saleable retail cuts or tenderness, flavor, and other quality and value factors. Market forces are therefore unable to induce higher production of more desired qualities. Product flow is not smooth and accurate pricing is not possible.

d. Recommended solution or attack:

- i. Establish a Livestock and Meat Standards Branch in the Meat Organization.
- ii. Send selected personnel to study the function, mechanism, and operation of the U.S.D.A. Agricultural Marketing Service meat grading program.
- iii. Develop standards for carcass grades that will, as nearly as possible, correspond with and reflect values seen by meat industry experts and knowledgeable consumer representatives. Provisions should be included to allow for grade standard changes as experience and changing consumer habits dictate.
- iv. Expatriates will be required in steps i and iii.

e. Action underway or planned:

The Meat Organization is aware of the problem. Previously developed standards, though they are not being used, may provide a starting place for the development of workable standards.

f. Suggested steps and timing for carrying out recommendations:

- i. Immediately select an interested, competent person to organize the Livestock and Meat Standards Section in the Meat Organization. He should select a nucleus of staff for a training program in U.S.D.A.
- ii. Within three months, arrange a training program with the U.S.D.A. Agricultural Marketing Service.
- iii. In the fourth and fifth months, complete travel and training and return to Iran to begin preparation of grade standards.
- iv. During the sixth, seventh, and eighth months, work with expatriate experts (FAO and U.S.D.A.) to develop grades and grade standards for carcasses of beef, mutton, and goats. Training program for official graders should begin.
- v. From the eighth month to the end of the year, the training program for the first official graders would be carried out and a test grading program started in Tehran.
- vi. At the one-year mark, the program should be reviewed and a schedule prepared for further expansion. This would include regular training programs for new official graders and refresher and coordination courses for experienced graders.

g. Possible alternative solution or attack:

The only workable alternative would be the establishment of a similar group in the UNDP Center for Agricultural Marketing Development in MCRA. Even if this alternative is used, the dominant position of the Meat Organization in the marketing of domestic and imported mutton and goats will require its co-operation if the program is to succeed.

3. Feeder Stock Marketing System

a. Problem:

There is no effective, organized marketing program geared to the procurement and movement of feeder livestock for large commercial feedlots.

b. Causes of problem:

Production systems have included no large commercial livestock feeding operations and consequently no distinction between uses to be made of marketed livestock was needed. With demand for feeder animals almost non-existent, a system for moving feeders as a specific commodity was not necessary. Demand for meat from fed cattle and sheep was small and relatively inelastic. This demand situation has been drastically altered and continues to increase and become less inelastic as consumers tastes and preferences change and as their ability to buy improves.

c. Consequences of failure to solve:

- i. Large, commercial feeding installations will not be able to operate efficiently or effectively.
- ii. Fed beef and mutton production will fluctuate significantly by season.
- iii. Removal of young, thin animals with feeding potential from ranges will not be accomplished in the manner and to the degree needed to reduce grazing pressure, reduce migration or winter season weight losses, and increase supplies of high quality animal protein.

d. Recommended solution or attack:

- i. Establish a use classification and quality standards grading system including standards for both slaughter and feeder livestock.
- ii. Sell live animals on a live weight basis.
- iii. Through price for slaughter animals, discriminate to the fullest justifiable extent against animals that will produce a low-yielding carcass of poor eating quality.
- iv. Through price for feeder animals, encourage marketing of young, thin animals with feeding potential to feedlot buyers.

- v. Develop a transportation subsidy permitting feedlot operators to move feeders from areas too distant for transport to be economically feasible.
 - vi. When costs of gain in feedlots will not permit feedlot operators to compete with slaughter buyers for young livestock with feeding potential, the price of feed inputs or the price of feeders will require subsidization. This may not be palatable or even feasible but it must be considered in light of other government policies.
 - vii. Establish markets along migratory routes to syphon off potential feeders. An immediate payment program will be required to induce their use.
- e. Action underway or planned:
- Fars Meat complex has attempted to use Forest Organization stations in the vicinity of Shiraz as assembly points to barter feed for sheep. The success is limited. Ziaran Meat Production Company and Magsal are buying a limited number of feeder cattle.
- f. Suggested steps and timing for carrying out recommendations:
- i. Immediately develop an immediate payment policy for MANR agro-industry buying.
 - ii. Immediately form the nucleus of a MANR regulatory agency to study market regulation agencies in the United States, Australia, and selected European countries with the objective of establishing an agency to regulate marketing.
 - iii. Immediately form time table to establish Livestock and Meat Standards Agency and to develop a classification and grading system for livestock and meat.
 - iv. The Animal Husbandry Organization should immediately prepare cost of production guidelines to use in determining approximate price levels or subsidy levels required to encourage feeding and induce marketing of feeder livestock.
 - v. Immediately select market assembly points along migratory routes.
 - vi. At the one-year mark, begin installation of scale units for live weighing. Have plan developed for installation of live weighing units at all MANR live animal buying units.
 - vii. At the end of the year develop a training program for buyers (private and public sector) and affected government staff on grades for slaughter and feeder classes and grades.

g. Possible alternative solution or attack:

Significant development in marketing must occur soon if the feedlot development is to succeed. Besides MANR, the only group in Iran with the expertise is in the UNDP Center for Agricultural Marketing Development in MCRA.

4. Marketing Education Programs

a. Problem:

The livestock marketing industry and village, tribal, and other livestock producers have almost no access to market information nor to educational programs related to marketing livestock and livestock products.

b. Causes of problem:

When MANR and MCRA were formed, the primary responsibility for market development and education went with the UNDP Center for Agricultural Marketing Development in MCRA. The MANR Extension Service apparently has no authority nor responsibility to conduct educational programs related to the marketing of livestock and livestock products. While other MANR bureaus may conduct marketing programs of a sort, they do not reach many of the producers or the market industry.

c. Consequences of failure to solve:

Development of an efficient, market-motivated livestock industry will be significantly delayed. Without effective educational programs for marketers and producers, needed shifts in production methods and kinds of animals produced will not occur. Delays in attaining these market motivated changes will result in excess feedlot capacity.

d. Recommended solution or attack:

- i. Establish a marketing section in the MANR Extension Bureau.
- ii. In cooperation with the U.S.D.A. Extension Service, send selected personnel to the United States to study the extension marketing programs conducted by the Federal and state staff for the livestock industry.
- iii. Develop an extension marketing program geared to the needs of the Iran livestock industry.
- iv. Use U.S.D.A. Extension Service marketing experts.

e. Action underway or planned:

There is no indication of any action on the level needed.

- f. Suggested steps and timing for carrying out recommendations:
- i. Immediately select a competent person, preferably with a degree in agricultural economics, to organize the MANR Extension marketing section. He will select personnel who will study U.S.D.A. marketing education programs.
 - ii. Within three months, arrange training program with the U.S.D.A. Extension Service.
 - iii. The U.S. training program should be carried out in the fourth and fifth months.
 - iv. In the sixth, seventh, and eighth months, work with U.S.D.A. Extension Service marketing experts in developing marketing programs for marketing industry and producers. Cooperation and coordination with the Livestock Standards Branch of the Meat Organization will be essential.
 - v. At eight months, and prior to the placing of marketing experts in the Ostans, the programs should be tested by central office experts.
 - vi. At one year, the tested programs should be reviewed and expanded. Placing of marketing experts in the Ostans should begin.

5. Feed Marketing System

a. Problem:

The livestock feed and feed grain processing, storage, and transport system is inadequate for the rapidly developing livestock industry. The price structure and other intended incentives to increase production of forages, feed grains, and food grains are unnecessarily competitive and not fully effective.

b. Causes of problem:

Increased use of feed grains, forage, and other livestock feed ingredients in feeding domestic livestock has significantly generated demand for these commodities. With strong competition from food grains, fiber, sugarbeets, and other commodities for domestic production resources, large quantities must be imported, further adding to storage and distribution difficulties. The strong demand surge for meat and the import of live sheep for feeding and slaughter places an additional load on the already overworked system.

c. Consequences of failure to solve:

- i. Large commercial livestock, poultry, and dairy installations will not be able to operate efficiently and perhaps some will not be able to operate at all.
- ii. Inadequate supplementation of feed for breeding flocks during severe weather and other periods of stress can cause excessive death loss and other production losses.
- iii. Uncoordinated application of price and other incentives to increase production of various commodities can cause sudden shifts from one to another which could cause disruptions in livestock feeding programs.

d. Recommended solution or attack:

Bring at least two U.S. livestock feed and grain experts to Iran to work directly with Pasture Development Fund and those agencies in MCRA and the Ministry of Commerce which develop policy on food grain programs and the importation of feed and food commodities. This group would develop a coordinated program for price supports and ceilings for all feed and food grains and for all production subsidy programs. Transport, storage, and import programs would be coordinated. This group would also inventory feed and grain storage and feed processing capacity presently available or under construction. Current facilities for wheat, rice, and feed grains would be considered. A similar exercise would be performed for feed processing and distribution.

e. Action underway or planned:

Although independent agencies are projecting needs and attempting to cope with rapidly expanding needs, coordinated efforts are negligible.

f. Suggested steps and timing for carrying out recommendations:

- i. Immediately establish a task force with authority to coordinate programs where possible and to recommend legislation where necessary.
- ii. Negotiate with U.S.D.A. for experts to be available as soon as task force is organized.
- iii. Within six months, complete survey and inventory and begin development of plan based on needs as indicated by projections.
- iv. At one year, complete plan and begin to implement.

g. Possible alternative solution or attack:

There is no alternative to a coordinated program. This could be attained by centering the authority and responsibility for livestock feed, feed grain, food grain, and related commodity programs in one Ministry.

6. Slaughter Facilities

a. Problem

Many livestock slaughter facilities are obsolete, do not meet sanitary standards, and have little or no refrigerated cooler space for even minimal storage of meat.

b. Cause of problem:

Iran has traditionally consumed meat soon after slaughter. Adequate slaughter to meet relatively low demand has not required refrigerated storage to regulate flow and to provide uniform supplies. Large recent increases in consumer income have contributed to a dramatic surge in meat demand. Population shifts to large urban centers have made it impossible for the traditional system to meet increasing consumer desires for meat; the emerging market oriented system is severely strained. Antemortem and postmortem inspection varies in quality from excellent to none.

c. Consequences of failure to resolve:

Inefficient use of the available supply of slaughter animals will result in wasteful gluts followed by shortages. Animals slaughtered under unhygienic conditions can transmit disease or food poisoning to consumers. This danger is significantly increased when the stored life is extended even under ideal temperature and other storage conditions.

d. Recommended solution or attack:

- i. Establish a meat inspection agency national in scope and not under control of municipalities. This agency would be responsible for antemortem and postmortem examination of animals prior to and during slaughter. It would also have authority to be responsible for inspection and approving the hygienic conditions of meat wholesaler, processor, and distribution facilities, including transport.
- ii. Develop a complex of modern slaughter plants in the areas of production to replace the present system of municipal abbatoirs. These should meet desired standards for hygienic conditions. The design and construction contracts should be under the supervision of the Meat Organization, if it is to be the operating agency. Slaughter plants now under construction or recently completed in several cities have been built under the supervision of another Ministry. These appear to be poorly designed. For future construction design, engineering consultants should be selected from countries with highly advanced livestock production and livestock marketing industries.

e. Action underway or planned:

- i. The Meat Organization is keenly aware of the problem.
- ii. Several new slaughter plants to serve cities are nearing operation. While these are not as efficient or well designed as desired, they are significant improvements over the municipal plants they will replace.
- iii. A large capacity plant is under construction at the Fars Meat complex near Shiraz. The Ziaran operation between Karadj and Qasvin is large, well-designed, and should be a very efficient plant.
- iv. The Meat Organization has plans for modern processing facilities at Esfahan and Tehran.

f. Suggested steps and timing for carrying out recommendations:

- i. Immediately arrange for slaughter plant design engineers in the United States to review present facilities and aid in the planning for future construction.
- ii. Immediately determine through a feasibility study the optimum location and desired scale for future plant construction.
- iii. Immediately develop the existing meat inspection program of the Veterinary Organization into a national program that is not subject to municipal governments and which supervises the entire meat industry.
- iv. Send top administrators of the responsible agency to observe operations in the United States and the United Kingdom.
- v. Within six months, complete organization and begin training program. Use Iranian and U.S.D.A. staff as instructors.
- vi. At one year, complete training program and have test-run in operation.

g. Possible alternative solutions or approaches:

The only feasible alternative is for the Meat Organization to develop its own meat inspection program.

7. Cold Storage

a. Problem:

There is inadequate cold storage (frozen and chilled) for meat and other food products.

b. Causes of problem:

The rapidly expanding demand for meat and the seasonality of domestic production has made it impossible to supply fresh meat in the quantities and at the time needed by consumers. Cold storage completed in recent years has suddenly become inadequate as oil income has soared, consumer disposable income increased sharply, and government subsidies at the retail level have generated increases in meat consumption. Government efforts to provide supplies to meet this demand by importing larger quantities of frozen and chilled meat have strained capacity of available storage. Capacity of ocean-going refrigerated vessels is much larger than that of the cold store at Bandar Abbas; this creates unloading problems at Khoramshahr and Bandar Shahpur.

c. Consequences of failure to solve:

Inadequate cold storage will make it impossible for the Meat Organization and the private sector to store sufficient supplies of meat to fill consumption needs during those periods when domestic slaughter is low. Seasonal surplus production of mutton cannot be harvested and stored. The failure to slaughter during peak seasons places additional numbers to be fed on already inadequate feed supplies. Total meat supplies are reduced because of weight and death losses when animals are fed at or below maintenance levels. A shortage of cold store space in the port area slows unloading and increases transportation costs.

d. Recommended solution or attack:

- i. Build new or expand facilities in areas where surplus supplies are available at certain times of the year (such as Mashhad).
- ii. Expand storage capacity either through rental or building additional space in the Bandar Shahpur, Abadan, and Khorramshahr areas.
- iii. Expand storage capacity in urban areas where present space is insufficient (such as Esfahan).
- iv. Move toward importation of boxed meats as rapidly as consumer attitudes change.
- v. Continue investigation of needs for additional cold store locations.

e. Action underway or planned:

- i. The Meat Organization has recommended and requested expansion of some existing facilities and the addition of new cold store locations.
- ii. Private sector facilities are, in some cases, under-utilized and the Meat Organization is, where feasible, negotiating for their use.

f. Suggested steps and timing for carrying out recommendations:

- i. Expansion plans for Abadan, Mashhad, and Esfahan should be implemented as soon as possible.
- ii. Plans for tentative other expansion and new locations for cold stores should be made firm as soon as possible.
- iii. Bandar Shahpur should be considered for a modern container handling facility.

g. Possible alternative solution or attack:

It is possible to provide additional space in the private sector but with the prime responsibility for providing mutton falling on the Meat Organization. Adequate space must be available on a long-term basis.

8. Retail Meat Distribution System

a. Problem:

The retail meat distribution system is inefficient and unsanitary and increases cost of meat and meat products to consumers.

b. Causes of problem:

Most small shops are hold-overs from the past when the transport system was not suitable for meat distribution. The low volume handled does not justify investment in adequate refrigeration equipment for proper meat storage nor for providing an insect free, mechanically cooled area for preparing meat for sale. Most personnel are not trained in meat hygiene and are not able to maintain proper conditions. The exact legal requirements for maintaining proper temperatures and other factors to insure wholesome meat in meat shops are difficult to determine because this segment is under the control of another Ministry. Little evidence of control is apparent and the Meat Organization does not have the authority to require even the most dirty to clean up. Small inefficient shops continue to compete, partially because of reduced costs which are possible because of inadequate equipment and poor hygienic standards.

c. Consequences of failure to solve:

- i. The number of cases of food poisoning from meat in Iran is not available but the threat is significant.
- ii. Inadequate refrigerated storage at many retail shops makes it difficult to hold over excess supplies from one day to the next or over a weekend. This tends to waste products and provides an excellent opportunity for food contamination.
- iii. The Meat Organization does not have the authority to control or regulate conditions in retail shops and the lax control by other agencies allows the wasteful and dangerous situation to continue.

d. Recommended solution or attack:

- i. Encourage municipalities and affected federal agencies to develop and enforce stronger regulations regarding the hygienic standard for retail meat shops.
- ii. Continue development of central packaging operations where storage and other conditions can be effectively controlled and the wholesomeness and quality of the meat can be maintained.

e. Action underway or planned:

- i. The Meat Organization is striving to induce shops to improve conditions and obtain adequate refrigeration equipment to maintain temperatures at a level low enough to provide safe storage.
- ii. The Zaffar packaging plant is providing quality products and is a training facility for other such installations.
- iii. The Meat Organization is operating a small beef packaging plant.
- iv. A larger, more sophisticated plant is in the contract stage. It is to be located in the northwest area near an expressway.

f. Suggested steps and timing for carrying out recommendations:

- i. Immediately present this review of problems and the report by FAO consultant Dr. Morris Ingram to the municipality of Tehran and other cities to encourage development and enforcement of adequate hygienic standards and regulations for meat shops.
- ii. Proceed with the development of centralized packaging centers as a means of achieving quality and hygienic control, improving utilization, and reducing waste.

g. Possible alternative solution or attack:

If the private sector shops and supermarkets do not provide facilities of acceptable standards, the Meat Organization should consider establishment of shops where wholesome meat and other protein foods will be available to consumers.

9. Market Information

a. Problem:

Live animal and carcass meat prices, market volume, slaughter data, and movement information are not reported regularly or accurately.

b. Causes of problem:

In the traditional market system, there was less need for market information. Standardization of product, which is essential, was not available. Market forces have resisted development of a dependable, accurate reporting system.

c. Consequences of failure to solve:

Market motivated industry development will be limited, producers will be at a disadvantage, and additional production of livestock and meat will not be encouraged adequately.

d. Recommended solution or attack:

- i. MANR should begin to study the procedure for developing such a reporting system. This would include contacting the FAO Marketing Center to learn of their experiences and to determine why this project is not currently functioning as a price reporting agency.
- ii. Send MANR personnel to U.S.D.A. to observe and study the functioning and operation of Livestock Market News.
- iii. Develop a system to report at least major market areas.

e. Action underway or planned:

The FAO Marketing Center had developed the basic structure of a reporting system. Apparently no action is presently being taken by MANR.

f. Suggested steps and timing for carrying out recommendations:

- i. Immediately begin study of current situation and of the defunct FAO Marketing Center program.
- ii. As soon as above is complete, send selected members of the study group to U.S.D.A. for one to two months to study the Livestock Market News Branch of the Agricultural Marketing Service.
- iii. In six months, begin the organization and training to initiate reporting the Tehran market.

- iv. In one year, expand to other important market areas such as Mashhad, Shiraz, Kermanshah, and others.
- v. At two years, review operation and plan further expansion.
- g. Possible alternative solution or attack:
Reactivate the FAO Marketing Center project and eliminate the reason for its discontinuance.

E. AGRICULTURAL RESEARCH, EXTENSION, AND EDUCATION

The basic foundation of a modern agricultural economy is an effective system for agricultural research, extension, and education. Research is vital to the continuous flow of new methods and technologies. Extension brings the benefits of this new information to a wide group of farmers and others involved in the agricultural sector. And effective education programs assure a continuing supply of trained manpower to manage agricultural development programs, conduct research, operate extension programs, manage farm cooperatives, and a myriad of other pursuits requiring specialized skills.

Iran has not had either an efficient or an adequate research program. Recent enabling legislation has permitted development of a greatly improved and strengthened organization; full implementation should have the highest priority.

Extension passes the needs of farmers on to the researchers who in turn pass their findings back to the extension workers to give to farmers. This process is not working well in Iran. Part of the reason is the general isolation of the extension work from research. Part of it is due to the fragmentation of the extension effort. And part of it is due to the inadequate preparation other extension workers receive before dealing with farmers. Since extension touches on all fields of agriculture, it is treated here as a total program in which livestock extension is a part. If the whole extension program is strong and progressive, it follows that the livestock subsector will improve along with the rest of the agricultural sector.

Trained manpower is urgently needed. The country has recognized this need and is striving to develop its educational institutions. However, unless this effort is greatly increased, Iran will fall far short of meeting the manpower needs of the Fifth Development Plan.

This section focuses on ways to improve (1) research, (2) extension, and (3) education.

1. Agricultural Research

a. Problem:

Agricultural research in Iran has not provided research information in either the quality or quantity required to provide basic information needed for livestock producers to reach maximum efficiency, for the development of optimum range management programs, or for the maximum production of livestock feed.

b. Causes of problem:

- i. Too few scientists have been employed.
- ii. Numbers of trained scientists available for employment have been insufficient.
- iii. Scientists have not been adequately supported.
- iv. Low salary levels for scientists are a disincentive for trained people to make a career in research. As a result, turnover has been excessive.

c. Consequences of failure to solve:

Animal production, as well as other segments of agriculture, will continue at lower than attainable efficiency. Animal products will be in short supply and imports of large amounts of animal products will continue. Feed supplies will be substantially below needs. Programs to conserve and improve ranges will be significantly hindered by lack of knowledge.

d. Suggested solution or attack:

Recent passage of legislation established a new National Agricultural Research Organization for Iran. Currently, preliminary plans have been developed for implementation of expanded research programs in animal science, pasture and forage production, and range management, as well as other areas of agriculture.

It is imperative that implementation of these plans have the personal support of the MANR Minister and they be given top priority for allocation of funds both in the Ministry and at higher levels of government. The plans provide for an increase of several fold in numbers of scientists in areas related to animal production within the next ten years. In addition to high priority for increasing numbers of scientists, it is vitally important that equal attention be given to:

- i. Developing and financing a training program to develop the capabilities of the necessary scientists.
 - ii. Providing salaries adequate to maintain staffs of well-qualified, creative scientists who will make research their only career.
 - iii. Providing physical facilities, animals, equipment, supplies, and support personnel adequate to enable each scientist to be fully effective.
 - iv. Providing a modern, streamlined administrative structure free of unnecessary paperwork to minimize the number of scientists in administrative positions and to keep individual scientists free of burdensome details of management.
- e. Action underway or planned:
- The new legislation for the research organization is a significant step forward.
- f. Suggested steps and timing for carrying out recommendations:
- Step-by-step plans for full development of a productive research organization over a ten-year period, as currently being developed by the Ministry through a contract with the Development and Resources Corporation, should be followed. This program includes hiring expatriate scientists as an interim measure until Iranians can be trained in adequate numbers.
- g. Possible alternative solution or attack:
- Technology must either be developed in a country or adapted from research done elsewhere. Imported technology is highly useful and should be used to the fullest extent possible. For some phases of animal production, such as intensive poultry production, it may provide most of the information required for an efficient industry. For most phases of agriculture and animal production, it is necessary to carry out research under local production conditions using materials of the area. This is particularly true of range management and forage production. Thus, there is no viable alternative to development of an effective program within the country for agricultural research.

2. Extension Activities

a. Problem:

Extension activities do not make the impact required to transform Iran's agriculture.

b. Causes of problem:

- i. The Extension Service has insufficient personnel to carry out the task they are called upon to do.
- ii. The extension training programs are inadequate, especially those parts dealing with the practical aspects of farming.
- iii. There is a lack of coordination between the agricultural research, extension, and training programs in Iran.
- iv. Extension efforts are divided between several agencies with little coordination between them.

c. Consequences of failure to resolve:

- i. Agricultural production will fall behind in meeting the food needs of the nation.
- ii. Duplication of extension effort will result in a waste of valuable manpower and other resources.
- iii. Inadequately trained extension workers cannot command the respect of farmers and therefore cannot assist them properly.
- iv. The lack of coordination, especially between research and extension, will result in research activities that do not fit the needs of the country, or in research results unused because they are unavailable or not known by extension personnel and farmers.

d. Recommended solution or attack:

- i. Give one agency full responsibility for all agricultural extension in Iran. Elevate extension to the deputy minister level in MANR.
- ii. Provide a coordinating mechanism that will require formalized discussions and flow of information between research and extension. This coordinating mechanism should also give extension an input into the educational and training programs for extension personnel at all levels.

e. Action underway or planned:

None known.

f. Suggested steps and timing for carrying out recommendations:

- i. A committee should be formed consisting of all agencies now engaged in extension activities. (Extension Service, MCRA, Soil Institute, Plant Protection Institute, Ministry of Energy (ME), etc.). This committee should provide an inventory of all extension activities along with the physical facilities and equipment available for training and demonstration purposes. It should draft a complete extension plan including manpower requirements and capital needs for a single agency to serve the needs of Iranian agriculture. This should be completed within three months. This plan should be submitted to MANR, MCRA, and ME for review. This review should be completed within one month and returned to the committee for revision and final drafting. This should be completed in two months.
- ii. Legislation should be drafted incorporating the various extension activities into one organization.
- iii. The organization of MANR should be broadened to include a Deputy Minister for Extension. The Minister should simultaneously develop a coordinating mechanism between the Deputy Ministers for Research and Extension to assure that they are working toward common purposes.

g. Possible alternative solution or attack:

Extension activities can be placed under a deputy minister to be called the Deputy Minister for Extension and Research. All extension activities of the MANR would become part of the one extension organization (for example, Soil Institute, Plant Protection Institute, etc.).

Extension activities now being provided by the MCRA to assist farm corporations and production cooperatives would continue but the training of these personnel would be provided through the facilities of the Extension Service. The work of these special extension agents would be assisted by Extension Service personnel in the Ostans in which the farm corporations and production cooperatives are located.

3. Education Program

a. Problem:

The supply of trained personnel falls far short of the needs required to adequately develop Iran's agriculture.

b. Causes of problem:

- i. Increased emphasis on improving agricultural production and marketing has created an acute shortage of trained personnel.
- ii. Existing agricultural training schools are not geared to turn out sufficient numbers of trained personnel to meet the demand. Training institutes, such as the Farm Management Institute, have not been developed on a large enough scale to satisfy needs.
- iii. Lack of coordination in training programs (MANR, MCRA, the Ministry of Education, and the Ministry of Science and Higher Education) has resulted in duplication of facilities and a waste of resources.
- iv. The quality of the training programs has suffered from lack of qualified teachers and from curricula not oriented sufficiently toward practical application.

c. Consequences of failure to resolve:

- i. Iran will continue to fall behind in crop and livestock production.
- ii. Large and increasing outlays of money for imported foods will result.

d. Recommended solution or attack:

- i. Create an overall coordinating agency for agricultural education and training.
- ii. Reach a realistic consensus of the needs for trained agricultural manpower at all levels for the next 20 years. (Use all recent consultant reports and MANR projections.)
- iii. Survey the facilities and manpower now available for training purposes.
- iv. Initiate a crash building and training program to develop facilities and instructors required to fill projected needs.

- v. Develop curricula for all levels of instruction: vocational agricultural schools, colleges of agriculture, and universities.
- vi. Maintain a roster of trained personnel.

c. Action underway or planned:

An Educational Task Force was recently created to study educational needs and a working party has been established to study manpower needs for rural development. The working committee proposed here would go well beyond the scope of this task force but should coordinate its activities with it.

A consolidation of the vocational agricultural schools, now under the Ministry of Education, with the agricultural training program of the MANR is underway. However, this has been delayed because the Ministry of Education has not yet approved the curricula.

f. Suggested steps and timing for carrying out recommendation:

- i. Establish a working committee composed of representatives from MANR, MCRA, Ministry of Education, and Ministry of Science and Higher Education. This committee would form two sub-committees: (1) to establish the needs for trained manpower at all levels for the next 20 years, and (2) to conduct a survey of the existing facilities and manpower available for agricultural training (by categories, e.g., animal husbandry, crop production, etc. and by levels). Note: the manpower training projection should have an overage factor to allow for loss to non-agricultural activities.
- ii. A program will be developed by the committee that will supply the projected needs for the next 20 years. This program will consist of land, building, and equipment needs and manpower needs. The manpower needs will be categorized by type specialties required. Steps i and ii should be completed in 120 days after the formation of the committee.
- iii. The committee, with the assistance of consultants from Iran and elsewhere, will develop curricula designed to meet the future agricultural needs of the country. This step should begin prior to the completion of step ii, but will require time beyond the completion of step ii. This should be ready within six months after the committee is formed.

iv. The program should be presented to the involved ministries for review and approval. If legislation is required, it should be started at this point. Six to 12 months will be required from the time the committee submits its program until the plan can be initiated.

g. Possible alternative solution or attack:

It is assumed that the MANR, MCRA, and the Ministry of Science and Higher Education will develop this program and that each will be delegated their responsibilities for agricultural training. It is assumed, too, that the Ministry of Science and Higher Education will be responsible, as now, for all training at college and university level, but that both the MANR and MCRA will have an input into the development of curricula relating to agriculture.

As an alternative, all responsibility for agricultural education at levels below colleges would be delegated to MANR. The MCRA would have an input into the development of schools and curricula relating to its needs for trained manpower.

F. COORDINATION

Prime responsibility for agricultural development is divided between MANR and MCRA. Other ministries, such as the Ministry of Energy, also have some responsibilities affecting the agricultural sector. Any division of responsibilities inevitably means that a certain amount of duplication of effort occurs yet it appears that a single ministry in charge of agriculture is unlikely. It is therefore necessary to look for ways whereby many of the agricultural activities of the various ministries can be coordinated to minimize duplication of effort and waste of manpower and resources.

There is a need for (1) better coordination between MANR and MCRA planning bureaus, (2) improved statistics, (3) evaluation of farming systems, and (4) improved coordination and cooperation among MANR bureaus.

1. Coordination Between MANR and MCRA Planning Bureaus

a. Problem:

There is apparently little coordination between the planning bureaus of MANR and MCRA which have primary responsibilities in agriculture.

b. Causes of problem:

The two ministries have separate and different but overlapping roles in the development of agriculture. Planning bureaus of each tend to ignore one another.

c. Consequences of failure to solve:

- i. Agricultural programs will not complement one another.
- ii. Duplication of planning will waste scarce manpower and money.
- iii. The Plan and Budget Organization (PBO) will have difficulty using output of the planning bureaus in developing a comprehensive agriculture plan. PBO time and manpower limitations restrict effort by it to reconcile conflicts and to eliminate overlaps in the plans of the two agencies.

d. Recommended solution or attack:

- i. Establish a Center for Agricultural Planning in Iran (CAPI), to be responsible for all agricultural planning.
- ii. Staff CAPI with top agricultural planning economists in the country, supplemented as appropriate by competent expatriates trained in planning, econometrics, etc. Initiate a training program to upgrade capabilities of existing personnel and provide needed trained technicians.
- iii. Develop a mechanism whereby a proposed Agricultural Statistical Center of Iran (ASCI) and the proposed CAPI will coordinate their activities, especially with respect to the determination and satisfaction of data needs, timing requirements, etc.
- iv. Establish a central library facility as a repository for all in-house and consultant agricultural studies, reports, maps, and other materials needed for agricultural planning. A reproduction unit should supply microfilm or xerox copies of documents to those who need them. An important function of the library would be to translate into Farsi and English major studies made of Iran agriculture.

e. Action underway or planned:

The two ministries recently set up a high level committee to better coordinate their activities. Specific achievements and outlook for coordination of their planning bureaus are not known.

f. Suggested steps and timing for carrying out recommendations:

Development of such an integrated planning function presupposes and requires a high degree of coordination and cooperation between the two ministries and PBO. Although a coordinating committee has been established by the two ministries, it is not likely that the level of cooperation required to establish a single planning unit will take place without strong pressure. Advantages to be gained through greater coordination are so great that the Government should establish a committee to investigate ways to accomplish it. This could possibly be done through a coordinating committee attached to the Prime Minister's office.

i. Establish a high level committee consisting of representatives from MANR, MCRA, and PBO to develop a proposal for the organizational structure of CAPI. This should be done in three months and presented to the ministers for their review.

ii. After ministerial review and approval, a proposal should be placed in legislative channels. Twelve months will likely be required to enact CAPI legislation.

g. Possible alternative solution or attack:

As a preliminary step to the actual establishment of CAPI, the present coordinating committee of the two ministries could require at least annual joint reviews by the planning bureaus of each ministry. PBO representatives would participate. This would acquaint all three planning bureaus with the plans of the ministries and also provide an opportunity to suggest modifications or redirections of plans already made. Some consensus about basic data could be reached at these reviews.

2. Statistics

a. Problem:

Available statistics are inadequate, unreliable, and conflicting.

b. Cause of problem:

Several agencies (MANR, MCRA, and the Iran Statistical Center) gather statistics relating to agriculture. Each has requirements for specialized data which it considers not to be available or not reliable when gathered by other agencies. There is little coordination or cooperation between statistical bureaus of these agencies.

c. Consequences of failure to solve:

- i. Duplication of effort results in a waste of scarce manpower and equipment and large, needless expenditures.
- ii. Basic information about agriculture, including livestock, will continue to be inadequate, unreliable, and conflicting.
- iii. Variances in statistics published by different agencies make it difficult or impossible to plan effectively. Planning bureaus, consultants, and others often develop varying sets of recommendations, depending on the data source used.

d. Recommended solution or attack:

- i. Establish a single agency, ASCI, for collection and dissemination of all agricultural information.
- ii. Staff ASCI with top Iranian agricultural statisticians, supplemented as necessary by competent expatriates.
- iii. Initiate a training plan to upgrade existing personnel and provide for future ASCI needs.
- iv. Develop cadre of specialized ASCI field personnel.
- v. Equip ASCI with modern data processing equipment adequate to rapidly handle incoming and outgoing data.
- vi. Coordinate ASCI activities with those of PBO and the proposed CAPI.

e. Action underway or planned:

An FAO/UNDP report strongly recommended that a high level body meet once a year to agree on the scope of work to be performed by each agency. A technical committee would meet more often to review progress. However, it is not known if this recommendation has been accepted.

f. Suggested steps and timing for carrying out recommendations:

- i. Appoint a coordinating committee of representatives from MANR, MCRA, Iran Statistical Center (ISC), PBO, Bank Markazi, Ministry of Energy, and others that gather and/or need agricultural data. This committee should develop an organizational plan, manpower and equipment requirements, and a tentative budget for ASCI within two months.
- ii. Have legal experts draft legislation to formally establish the new organization. This draft should not take more than two months after which it should be placed in the legislative process.
- iii. Establish the ASCI within one year after legislation is enacted.

g. Possible alternative solution or attack:

The three major agencies collecting agricultural data (MANR, MCRA, and ISC) should establish a coordinating committee of the heads of the statistical services to cooperate and coordinate to the maximum extent possible with a view towards improving quality of data collected and reducing costs in money and manpower. The committee should hold regular meetings, perhaps bi-monthly. The work of this committee should be reviewed every six months by deputy ministers from each organization.

3. Evaluation of Farming Systems

a. Problem:

Facts are not available on the relative effectiveness of many different approaches taken to improve Iran agriculture.

b. Causes of problem:

The basic problem is believed to be the lack of coordination between MANR and MCRA. A secondary cause is the critical nature of agricultural problems in the country making it necessary to try unproven methods. There has now been sufficient experience to justify a thorough analysis and comparison of the results of different approaches to serve as guides to further development. MANR is actively promoting the formation of large agri-business production units and in several cases is itself operating such units under government ownership. It is also sponsoring area development authorities. MCRA is developing farm corporations and production cooperatives. Traditional agriculture is continuing and many farms of intermediate size are being mechanized and modernized under private ownership.

c. Consequences of failure to solve:

Vast sums of money may be wasted and the lives of large numbers of people disrupted in development schemes which may be unworkable or inefficient. Crop and livestock production may be reduced.

d. Recommended solution or attack:

Ministers of MANR and MCRA should jointly seek participation of a respected group such as the International Bank for Reconstruction and Development (World Bank) in conducting a thorough study of performance to date of each approach to increase agricultural production and to improve rural living standards.

Factors to be studied will include, but not be limited to, (1) effectiveness of each type of organization in increasing agricultural outputs per unit of land as compared to each other (compare traditional farms with mechanized and modernized farms of intermediate size under private ownership); (2) relative costs of attaining increased outputs; (3) relative sociological impacts both favorable and unfavorable of each type of organization.

e. Action underway or planned:

No critical evaluation efforts are known to be underway or planned.

f. Suggested steps and timing for carrying out recommendation:

- i. A contract should be developed and the group selected within six months to do the work.
- ii. The study group should present interim reports after 6 and 12 months of study with a final report 18 months after the study begins.
- iii. The Government should begin implementing the proposals immediately after submission of final report.

g. Possible alternative solution or attack:

The study could be made by personnel of the two ministries involved but impartiality would be very difficult to attain due to past involvements and commitments with specific programs. Thus, an outside group is preferable.

4. Coordination and Cooperation Among MANR Bureaus

a. Problem:

There is lack of cooperation and coordination among MANR bureaus.

b. Causes of problem:

- i. A sense of cooperation is not fully developed among bureaus.
- ii. Lack of regular circularization of bureau reports among bureaus and lack of a management training program gives rise to undue competition among bureaus.

c. Consequences of failure to resolve:

- i. Progress in agricultural development is impeded because the bureaus do not have full access to all helpful information or assistance.
- ii. The bureaus' failure to work together cooperatively deprives MANR of the many advantages of coordination.

d. Recommended solution or attack:

- i. Study interrelationships in MANR's administrative organization to determine which bureaus need to act together formally or informally. For example, the Bureau of Agricultural Economics and Statistics and the Bureau of Planning must have very close working relationships in order for each to carry out their responsibilities.
- ii. Once the interrelationships are determined, develop formalized mechanism to assure cooperation throughout MANR.
- iii. Develop a series of management training courses in which the advantages of cooperation and coordination are stressed. (See section on Administration.)
- iv. A mandatory circulation list of reports of the various bureaus should be developed, depending upon the relationships and needs of various bureaus.

e. Action underway or planned:

The present cooperation between bureaus is on an ad hoc basis, depending upon the desires of the individual director-general. There appears to be no formalized mechanism whereby coordination between directors-general is assured.

f. Suggested steps and timing for carrying out recommendations:

- i. Contract with a management consultant to complete a three-month study of the problem of coordination between directors-general throughout MANR.
- ii. Once the study is completed, hold a meeting of the Minister, Deputy Ministers, and all directors-general to hear and discuss findings and recommendations.
- iii. Appoint several committees of directors-general, according to the coordination groupings, to develop plans based on the consultant's report. These plans should be presented to the Minister within one month. After review, the Minister should approve or send back to the committees for revision.
- iv. After approval, initiate these plans. Provide for periodic followup action to assure continuing coordination and cooperation.

g. Possible alternative solution or attack:

- i. Continued case by case coordination by deputy ministers and directors-general. They will decide, as now, which bureaus should be consulted or which ones should receive progress reports.
- ii. Educate the directors-general, by the example of the deputy ministers, about the need and benefits of voluntary cooperation.

G. ADMINISTRATION

Successful administration depends upon the ability of an organization and its key officers to work as a unit in attaining desired goals. Problems of administration and management are the most pervasive of all problems of the civilized world. Some organizations are more successful than others but all must invest continual efforts to maintain and improve managerial performance. This section reviews two efforts which will improve the long-range effectiveness of MANR: (1) improved administrative procedures and (2) use of consultants.

1. Administrative Procedures

a. Problem:

MANR administrative procedures can be made more effective in enhancing its ability to deal with agriculture problems.

b. Causes of problem:

Roots of the problem are many and varied. Emphasis should be directed to correction rather than fault-finding.

c. Consequences of failure to solve:

- i. Inefficient use of trained personnel.
- ii. Unnecessary delays in decision making.
- iii. Many poor or wrong decisions due to inability to concentrate available talent on important problems.
- iv. Low Ministry esprit de corps.
- v. Reduced effectiveness in dealing with problems.

d. Recommended solution or attack:

- i. The Ministry should retain a competent management consultant firm on a continuing basis to conduct management courses and maintain full time advisors:

- * Conduct a sequence of courses in management techniques and procedures for Ministry personnel. It should consist of a one-week basic course required of all MANR supervisors; a two-week intermediate course for section heads, deputy directors-general (or higher), and for lower ranking personnel with the Minister's approval; and an advanced two-week course for all those of director-general rank or higher and for lower ranking personnel with approval of Minister.
- * Maintain a team of at least three management experts in the Ministry full time as an arm of the Minister and with his active support and guidance to: (1) consult continuously on Ministry-wide administrative procedures and make recommendations for improvement; (2) review administrative procedures of organizations within the Ministry and recommend changes when required; (3) work directly with a maximum of three Ministry counterparts, named by the Minister, with the objective

of training them to take over work of the outside management consultant in not more than five years; and (4) conduct specialized training for specific groups as needs arise.

- ii. Detail selected individuals already at director-general or deputy minister levels or equivalent, and persons considered to have potential of advancing to these ranks, to attend management courses of up to a year either in Iran or abroad depending upon availability of suitable courses.
 - iii. Establish a standing committee or task force representing all levels occupied by professionally trained people in the Ministry. With eight to ten members appointed by the Minister for staggered terms, it would function under the chairmanship of a deputy minister with meetings at least monthly or more often as needed to:
 - * Cooperate with the management consulting firm.
 - * Make suggestions for increasing effectiveness of the management courses.
 - * Aid in accumulation of information required for in-depth evaluation of current procedures.
 - * Consult, as requested, on suggested changes in administrative management procedures considered for possible adoption.
 - * Maintain continuous review of Ministry administrative management procedures and make recommendations to the Minister, when indicated, with the objectives of: (1) streamlining and simplifying procedures; (2) delegating authority and responsibility to the lowest possible effective level for each type of action; (3) relieving higher level administrators of unnecessary detail; (4) eliminating overlapping and duplicating functions; (5) developing adequate staff support; (6) making full use of all trained and qualified personnel; and (7) reviewing salary scales and fringe benefits.
 - * Recommend legislative changes required, if any, to implement recommended procedural changes.
- e. Action underway or planned:

Since enactment of the State Employment Law of 1966, the Government of Iran has been actively working to reform the public service and to develop training in public administration. The State

Organization for Administration and Employment Affairs has been formed and has been active in many fields, particularly that of position classification. Improvement of public administration is a prime goal of the Fifth Plan. The Ministry contracted with the Industrial Management Institute to review its administrative structure and to recommend changes. The report was presented to MANR in October 1972, but its recommendations have not been implemented.

f. Suggested steps and timing for carrying out recommendations:

The recommended program can be fully operational within six months through immediate positive action.

g. Possible alternative solution or attack:

Carefully planned short-term consultantships could accomplish many of the needed objectives but less efficiently and effectively than the plan outlined.

2. Effective Use of Consultants

a. Problem:

How to effectively and efficiently use consultants in MANR.

b. Causes of problem:

- i. MANR is not properly organized to achieve maximum benefits from consultants.
- ii. Consultants are often not given the necessary overview nor information concerning the total complex of problems.

c. Consequences of failure to solve:

- i. Some MANR money spent on consulting groups will be wasted.
- ii. Advice given may be faulty, erroneous, or incomplete.
- iii. Without a centralized file of pertinent reports for consultants' use, they will be unaware of and/or will waste considerable time locating such reports. Failure to review previous reports will result in duplication of efforts.
- iv. Without efficient administrative services, consultant time may not be effectively utilized.

d. Recommended solution or attack:

- i. The Minister should establish a firm policy, and make it known to all professional ministry employees, directing full cooperation with any consultant or advisory group having a valid contract or other agreement to conduct studies or to make recommendations. It should be recognized that consultants can be useful only if they are familiar with Iran agriculture and with the scope and effectiveness of past and current Government programs related to agriculture. They must understand the pertinent problems facing top administrators. They need to know current plans and potential options in order to advise effectively on best approaches.
- ii. A small group of professionally trained agriculturists to be called the "Consultants' Coordinating Unit," or some similar name, should be established as an arm of the Minister's office with the sole purpose of improving the effectiveness and efficiency of consultant use. The unit would:

- * Assemble and maintain a current indexed file of all studies of Iran agriculture and related areas such as surface and ground water prepared by consultants and groups such as FAO and World Bank.
- * Make all reports of previous studies and interim reports of ongoing studies freely available to all consulting groups and to all other concerned personnel of MANR and other ministries.
- * Assemble and maintain an indexed file of all planning documents related to agriculture and make these freely available.
- * When necessary, arrange for competent translation services. Incorporate translations into appropriate files to forestall subsequent duplication of translation.
- * Maintain complete file of current consulting contracts and other documents; make them freely available to all groups.
- * Aid all consulting groups in acquiring statistical and other needed information.
- * For consulting groups with a general mission and responsible to the Minister, provide administrative services, counterparts, secretarial services, escorts for travel, and other services such as appointments with key people as necessary for an effective and efficient assignment.
- * For consulting groups working with specific units of the Ministry and responsible to individuals in these units, maintain liaison to insure adequate services and to make needed assistance available.

e. Action underway or planned:

Ministry officials discussed with team members in June 1974, the need for a committee to coordinate work of consultants; but, to our knowledge no action has taken place.

f. Suggested steps and timing for carrying out recommendations:

Establish the recommended Ministry Consultants' Coordinating Unit in two months and provide necessary support and administrative power to enable it to be fully functional in six months.

g. Possible alternative solution or attack:

Services outlined could be provided by an existing MANR unit. However, if these services are not the first and most important responsibility of the group, they are likely to receive less than desirable effort.

APPENDIX A

THE U.S. AGRICULTURAL DEVELOPMENT TEAM

Robert E. Daugherty -- Livestock and Feed Marketing

For 15 years, Mr. Daugherty organized and conducted a livestock marketing program in Oklahoma and surrounding States. In this work, sponsored by the Extension Service, and also as a private consultant, Mr. Daugherty helped public and private groups on economic feasibility studies to determine location and operation of large cattle feeding operations. In 1971, Mr. Daugherty taught marketing methods in CENTO workshops in Pakistan and Turkey. This assignment also included discussions with Iran Ministry of Agriculture and Natural Resources officials. In 1972, he served as a World Bank consultant on a large, fully-integrated swine, beef, and dairy loan appraisal mission in the Republic of Macedonia, Yugoslavia. He has a B.S. degree (animal science) and an M.S. degree (agricultural economics) from Oklahoma State University.

Helmer C. Holje -- Land Use Planning

Prior to joining the Team, Dr. Holje was Director of Montana State University's Joint Water Resources Research Center, focusing on agriculture and land use, geology, biology, engineering, and other factors. From 1967-1969, he was in Pakistan as Director of the Reclamation Division, Indus Basin Works of the Harza Engineering Company International. For the previous 17 years, he was engaged in teaching agricultural economics and in research involving a variety of land-use projects. He is the author of more than 30 research publications on land use. He has B.S. and M.S. degrees (land economics) for Montana State University and a Ph.D. degree (land economics) from the University of Wisconsin.

Wesley Keller -- Forage and Feed Production

From 1956 to his retirement in April 1973, Dr. Keller directed arid range improvement research for the U.S.D.A. Agricultural Research Service. Included in his range improvement work were efforts to maximize efficiency of water use and increase success in range seeding. From 1936 to 1956, he was an ARS geneticist working on grass breeding for arid pastures and ranges, grass-legume mixtures for irrigated pastures, and improved management practices. Dr. Keller has published some 50 manuscripts. He has B.S. and M.S. degrees (agronomy, plant breeding) from Utah State University and a Ph.D. degree (genetics and plant pathology) from the University of Wisconsin.

Charles K. Laurent -- Agricultural Planning and Team Leader

Dr. Laurent has extensive experience with several U.S. universities and U.S.D.A. Since 1964, he has been involved in development planning and assisting agriculture ministries and other organizations in Colombia, Venezuela, Peru, Nigeria, Tanzania, and El Salvador. Dr. Laurent headed a U.S. feed manufacturing company for seven years. He holds M.S. and Ph.D. degrees in agricultural economics from Cornell.

Robert O. Rogers -- Project Evaluation

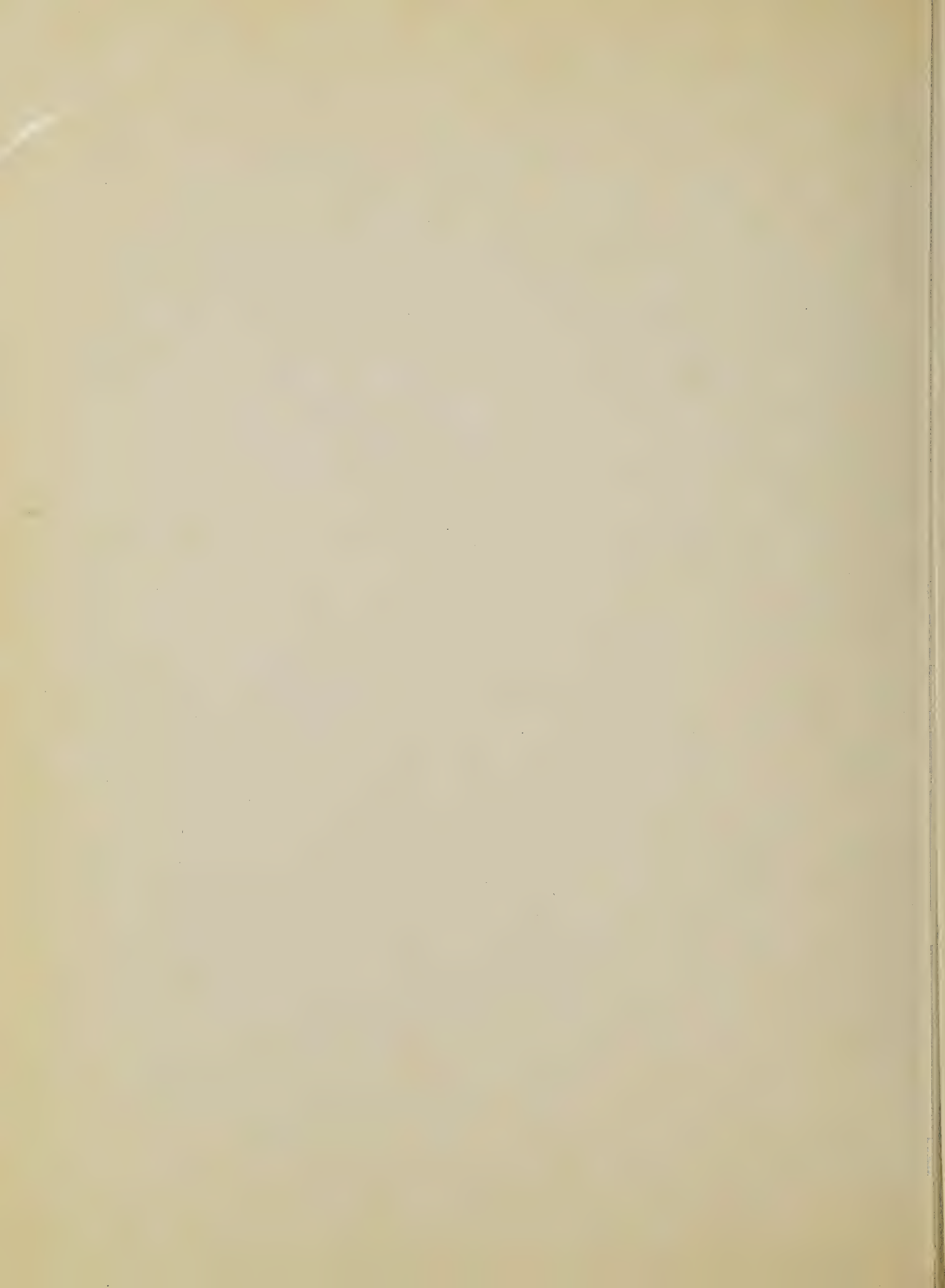
Mr. Rogers, director of the Program Planning and Evaluation staff of the Agricultural Research Service, monitors on-going programs as well as new proposals. He holds M.S. degrees from Washington State University and the University of Chicago and has studied at Harvard. He first worked for the U.S. Department of Interior in design and appraisal of land and water development projects.

Everett J. Warwick -- Livestock Production

Following graduate study, Dr. Warwick served on faculties at Washington State and Purdue Universities. He has been with the Agricultural Research Service since 1950, first as a beef cattle geneticist. For 12 years, he directed beef cattle research in genetics, physiology, nutrition, and management. He served four years as an assistant division director coordinating all meat animal research. Most recently, he has been a member of the National Program Staff. He is co-author of three textbooks on animal breeding and author or co-author of more than 75 professional papers. He received U.S.D.A.'s sustained outstanding performance rating in 1969. He earned a B.S. degree at the University of Illinois and M.S. and Ph.D. degrees in genetics and animal husbandry at the University of Wisconsin.

Gordon L. Watts -- Grazing Land Management

Mr. Watts has worked more than 30 years in range watershed management and other land management activities. He was deputy regional forester with the U.S. Forest Service, helping formulate and administer policies and programs relating to protection, management, rehabilitation, development, and utilization of resources in National Forest Lands in Utah, Nevada, southern Idaho, and western Wyoming. He shared supervision of about 4,500 Forest Service employees. He has extensive experience in grazing land management, including grazing allotments in low rainfall areas, and has planned and coordinated watershed programs with livestock range management and improvement activities. He has developed legislative reports and proposals working closely with representatives of Congress and Federal agencies. Mr. Watts has a B.S. degree in Forestry from the University of Michigan.



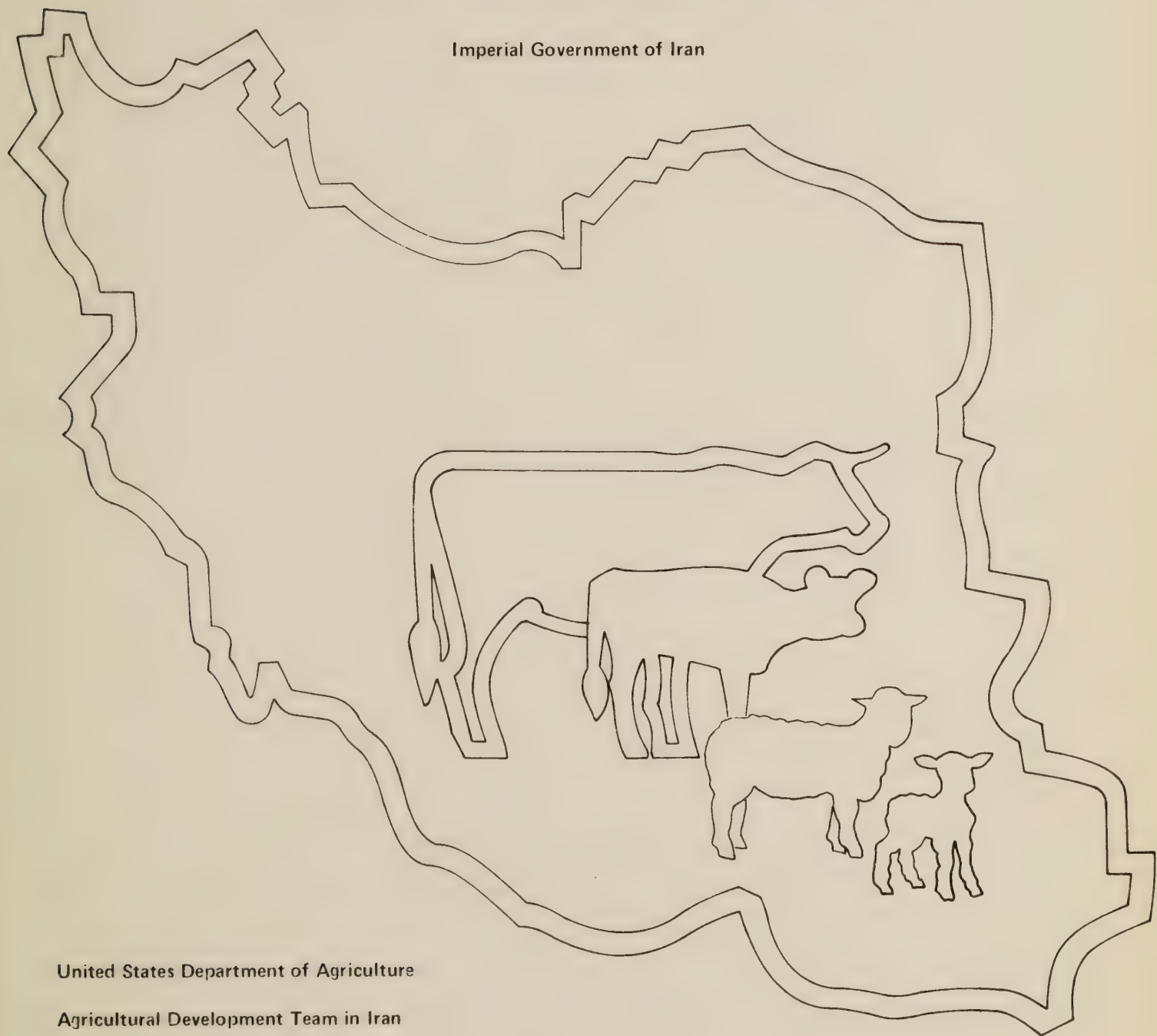
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Livestock Development

Volume 2

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Helmer C. Holje
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Wesley Keller
Forage and Feed Production

Charles K. Laurent, Team Leader
Agricultural Planning

Robert O. Rogers
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INTRODUCTION

In 1973 and 1974, a special livestock development team of the U.S. Department of Agriculture (U.S.D.A.) worked with the Iran Ministry of Agriculture and Natural Resources (MANR) in developing a system for improving that nation's livestock industry.

Recommendations by that team were published in a March 1975 report entitled Livestock Development. That first volume highlighted in outline form the major problems confronting Iran's livestock industry as well as recommendations for solution.

This publication forms the second volume of that report and enlarges upon some of its discussion. Like the first volume, it focuses, in succession, on:

- A. Rangeland Management
- B. Forage and Feed Production
- C. Livestock Production
- D. Marketing
- E. Agricultural Research, Extension, and Education
- F. Coordination
- G. Administration

This volume two discusses the problems and solutions outlined in volume one in much greater detail. The team has tried to include enough in the following discussion to more fully develop the reasoning behind the suggested solutions and to provide the reader with enough material to form his own judgment as to the merits of the proposals.

A. RANGELAND MANAGEMENT (Vol. 1, p. 6)

Domestication of sheep and goats in Iran began some 8,000 years ago; rangelands have been the principal source of food for these animals since. In the intervening years, a succession of diseases, natural calamities, tribal raids, and wars kept both human and animal numbers in general balance with nature's rangelands. As recently as only 400 years ago, most of Iran's mountain slopes and uplands were covered with grass, brush, or trees.

But, as modern times approached and various population checks became less influential, the numbers of people and livestock have increased substantially. Some of the good rangeland was converted to cereal production. Such trends gradually added to the burden placed on rangelands and their condition deteriorated slowly but inexorably.

Demand for both cereals and meat has mounted rapidly in the last several years and the deterioration rate of the rangelands has increased commensurately. To reverse rangeland damage and at the same time accelerate

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Demand for both cereals and
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production of livestock products, the U.S.D.A. team outlined five rangeland management problems and recommended solutions. The problems were (1) overgrazing, (2) classification and identification of grazing lands, (3) cultivation of marginal lands, (4) unauthorized fuel gathering, and (5) low productivity of rangelands. Following is a more detailed discussion of some of these problems.

Overgrazing (Vol. 1, p. 7)

Overgrazing is certainly the most critical problem in Iran's livestock development. Unless problems of overgrazing are corrected, grazing operations will be seriously disrupted. MANR faces a tremendous challenge to improve range conditions. This requires an imaginative, multifaceted, well coordinated, sustained effort on the part of all concerned. MANR leaders (including those in the Forest and Range Organization and the Range Management Bureau) are aware of the magnitude and complexity of this challenge. They are trying hard to increase the size, scope, and effectiveness of the range management program.

The Range Management Bureau has a national program to: (1) protect soil and its cover; (2) help meet animal protein needs of the people; (3) bring about a proper balance of grazing capacity and number of animals; and (4) provide for better utilization of natural resources. In the last five years, the Range Management Bureau staff has grown significantly in numbers and competence, in their recognition of range-watershed opportunities and constraints, and in their initiation of programs. However, the job ahead far exceeds present capabilities.

All range management activities are administered by the bureau's national headquarters in Tehran. This office reviews proposals for programs and projects submitted from the Ostans and suggests budget allocations for various approved proposals.

Too Many Livestock

Unless serious overstocking is stopped and a broad spectrum of other corrective actions are taken, the outlook is for a continued downward trend for range plants and soil. Unfortunately, basic data on range and livestock, vital in developing a program to stop overgrazing, have a number of deficiencies. The Range Management Bureau states that it is impossible to make authoritative statements describing Iran's situation in quantitative terms. Range livestock census figures are often unreliable. Forage production estimates are incomplete. The national cadastral survey needed as a base for nation-wide range surveys is not finished. The total range area regularly grazed by livestock is subject to significant differences of interpretations. Definitions of key terms (such as range and sheep unit) vary. Continuing changes occur in

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rangeland grazing and cultivation patterns due to erratic weather variations and because of competition among stockmen, farmers, and other land users. Other factors make it difficult to arrive at firm figures. Therefore, the area and distribution of rangelands and their forage types, the grazing use they receive, and their condition and trend can be described only in broad terms.

In 1970, the Range Management Bureau developed the following estimates of rangeland condition and productivity, based on definitions in Iranian laws concerning forest and rangeland protection and utilization:

<u>Range condition</u>	<u>Range productivity</u> (Kilograms per hectare per year)	<u>Range area</u> (Millions of hectares)
Good to fair	Over 450	19
Fair to poor	150-450	25
Poor to very poor	30-150	<u>56</u>
Total rangelands producing at least 30 kilograms per hectare per year		100

In contrast, the estimated total rangeland area reported in 1974 by FMC (in Interim Report 3, Volume I) is only about 71 million hectares. This difference may be less significant than it appears, however. Pabot's 1967 estimate of Iran's grazing lands was:

<u>Type of grazing area</u>	<u>Millions of hectares</u>
Semi-deserts, extremely poor rangelands	40
Depleted pastures and wastelands	32
Depleted forests, mostly shrubby range	14
Fallow	12
Pastures, good and fair	<u>8</u>
Total grazing area	106

If the 40 million hectares of "semi-deserts, extremely poor rangelands" are deducted from this 106 million figure, the remainder is 66 million hectares. This is reasonably close to the FMC estimate of 71 million.

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Depleted forests

Fallow

Pastures, good and fair

Total

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Heavy overgrazing occurring since 1970 has further damaged ranges. A conservative estimate is that today almost three fourths of Iran's rangelands are in poor to very poor condition. The Environmental Protection Department (and to a lesser extent the Range Management Bureau) has been able to close, at least temporarily, some range areas to livestock grazing. In a number of these areas, some recovery of plant vigor and soil conditions is evident.

Livestock estimates vary considerably; no source is generally regarded reliable.

The Range Management Bureau recently estimated that Iran's rangelands are supporting about 80 million sheep units. (See following table for conversion factors of each type animal to sheep units.) Payne estimated that, in 1974, the ruminant livestock in Iran totalled about 87.2 million sheep units:

<u>Class of livestock</u>	<u>Estimated total number</u>	<u>Equivalent sheep units per animal</u>	<u>Total sheep units</u>
Camels	400,000	8.0	3,200,000
Horses and mules	600,000	7.0	4,300,000
Donkeys	2,100,000	4.0	8,400,000
Cattle	6,000,000	5.0	30,000,000
Buffaloes	255,000	8.8	2,244,000
Sheep	30,000,000	1.0	30,000,000
Goats	<u>13,000,000</u>	0.7	<u>9,100,000</u>
Total	52,355,000		87,244,000

Payne assumed that all 42.3 million sheep units encompassing sheep, goats, and camels will be using the nation's rangelands. In addition, he assumed that "some considerable proportion" of the total numbers of horses, mules, donkeys, and cattle (representing an additional 42.6 million sheep units) also graze on the range for some part of the year. From these figures, along with the basic assumption that the FMC estimate of a total current carrying capacity of 11.4 million sheep units on these rangelands is correct, Payne concluded that the range was carrying at least four times as many sheep units as good range management would dictate, and possibly five or six times as many. In Annex I, an article

titled, "Deterioration of Grazing Land in Iran," develops considerable data to support an overstocking estimate of four to six times proper numbers. A Range Management Bureau estimate, made before the FMC report data became available, was that the grazing use of rangelands is about four times present capacity. Others in recent years have made estimates indicating stocking of two to twelve times the capacity.

Until nation-wide range surveys and analyses are completed, it will not be possible to develop a standard estimate of overstocking. At any rate, at least a 50 percent nation-wide reduction in stocking is immediately essential. In many areas, grazing reductions even higher than the initial 50 percent will be necessary for range-watershed protection. Such reductions must be carried out as rapidly as possible and should be done in one step. Otherwise, the reduction could be taken in 10 percent increments annually. Reductions may be wholly or partly achieved, in some situations, through later and shorter seasons of use, rather than reduced livestock numbers.

In some areas, range analyses may determine that range-watershed conditions and trends are good enough to warrant a restoration of part of the initial 50 percent initial reduction to the livestock operators. Care must be taken, in such cases, to assure that not even slight overstocking is permitted.

Livestock operators facing major range grazing reductions may complain vociferously. But, unless such reductions are taken promptly and supported as long as they remain necessary, the long-run serious adverse effects will be needlessly more severe and prolonged.

Many rangeland users attach undue importance to having large numbers of livestock, without regard to resulting range conditions and total animal weight production. This attitude can be changed through an intensive education program designed to show that total production of meat can be maintained with a smaller number of animals. Development of such an education program should be done within six months by a work group of representatives of the Range Management Bureau, the Meat Organization, and other concerned agencies, including at least one public information expert. The program should be completed within one year in all villages with tribal leaders.

A major reduction program could include some form of compensation for livestock operators who are adversely affected. This might include annual cash payments for a reasonable period, for each sheep unit reduced. Another possibility would be tax relief to compensate for reduction. Range Management Bureau personnel should develop an approach for the various aspects of the range livestock reduction program, consulting with representatives of other concerned agencies.

Operators affected by reductions could be promised that any subsequent increased capacity developing in their permitted areas would be restored to them rather than to some other operators.

Many grazing areas in poor condition are located in areas of steep slopes, thin or erosive soils, and/or low precipitation. Where such areas are identified, all livestock use thereon should be promptly terminated. Further livestock use should not again be permitted until it is certain that such use can be controlled in such a way that erosion does not increase.

All areas with average annual precipitation of less than 100 millimeters should be closed to grazing and remain closed until use without damage can be assured. The Range Management Bureau will likely find other types of areas which warrant immediate closure. The severe reduction actions which are essential may seem too drastic. But only a few people will be adversely affected by such actions, and compensation, if appropriate, may be granted quickly for any losses. If needed actions are not taken, the ranges will suffer for generations to come.

Range-Watershed Protection

Early, continuing protection must be given to all deteriorating range-watershed lands. Range rehabilitation measures are valuable, although the places where they can be effectively applied are relatively limited. Range protection has broad applicability and it often is fully as effective as more costly rehabilitation projects. The first, possibly most difficult, step is to stop overgrazing on all rangelands, including lands adjacent to villages.

Announcements will need to be accompanied by appropriate measures to assure that reductions occur. Revised grazing permits for reduced numbers must be provided to operators by the Range Management Bureau. Then Range Guards, in coordination with Range Management Bureau personnel in the Ostans, will need to be assigned the responsibility of seeing that permitted numbers and seasons are not exceeded. Where complete closure is specified, this also must be assured.

According to the Range Management Bureau, nearly 3 million hectares of rangelands are covered by protection plans. However, the degree of protection which such areas are receiving is variable and often inadequate.

Range Management Bureau and Range Guard manpower for enforcement is limited and/or not properly trained and supported. Also, both the senior officials and the guards are reluctant to take needed enforcement action. This is particularly true when the Government's enforcer of range protection requirements is only one man in a potentially hostile community or is dealing with an influential person. Such employees need support at all Government levels. Training of Range Management Bureau personnel and Range Guards should be completed within three

months. An adequate penalty will need to be determined and applied. This might require some additional legislation, although existing range protection and utilization laws appear to be adequate.

Stringent programs of range reductions and protection cannot be carried out unless the persons involved are first informed of the situation and plans. Therefore, an essential element will be adequate notification including (1) the need for protecting range-watershed areas, (2) the protection measures to be established, and (3) the enforcement actions to be taken. Extension Service employees could be assigned this notification responsibility and trained to carry it out. On the other hand, since the Range Management Bureau has the broadest responsibility for making reductions, it might be preferable to assign the overall notification job to this agency.

Consideration should be given to hiring livestock operators whose livelihoods have been adversely affected by the range-livestock reduction program to do the protection and rehabilitation work. This would help significantly to reduce the financial and other shocks of the reductions.

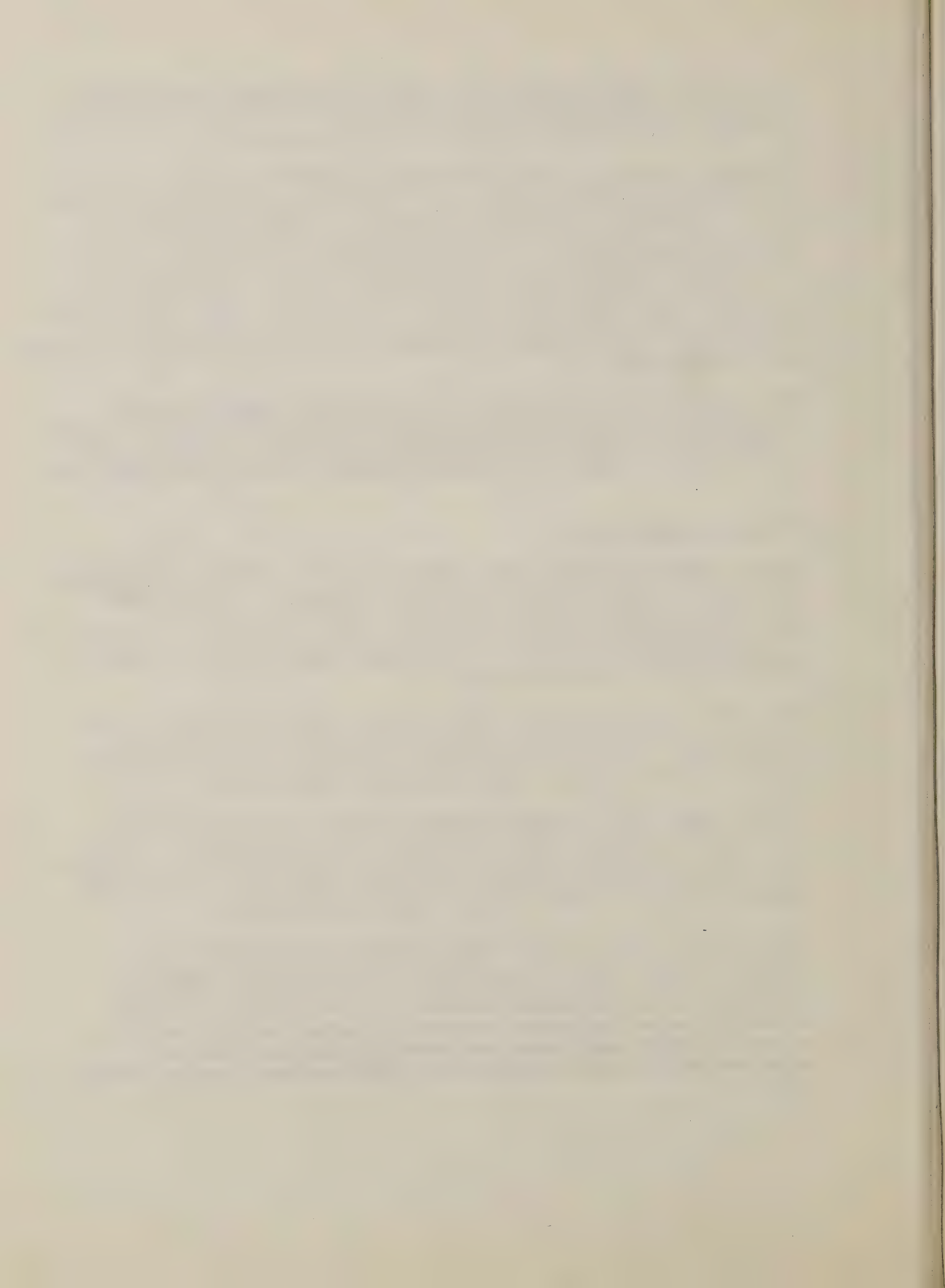
Rangeland Rehabilitation

Range rehabilitation and range improvement are two different activities. Range rehabilitation consists primarily of restoring a ground cover of plants adequate to hold soil in place and minimize erosion. Range improvement consists of additional measures designed to actually improve rangelands which are in satisfactory condition to increase their livestock carrying capacity.

Many areas in Iran have been overgrazed and deteriorating so long and heavily that protection will result in very slow or no increase in ground cover. Rehabilitation measures should be considered on these lands in order to secure timely recovery of ground cover.

Several years ago, the Range Management Bureau decided to initiate such corrective measures on rangelands as rapidly as feasible. Ostans were asked to determine range areas needing rehabilitation or improvement and to propose appropriate projects. By the end of 1973, over 860,000 hectares had been treated, in some degree, in 47 projects.

Such bureau projects to date have included planting of shrubs and seeding of grasses and forbs. Contour furrowing and pitting were applied in some of these projects for improving the infiltration of precipitation and for reducing erosion. The bureau also initiated a number of water development projects (including installation of 31 windmills and 343 stock water developments in various locations), nine seed multiplication stations, and eight emergency feeding stations.



The progress made in range improvement and rehabilitation of limited areas by the Range Management Bureau has been reasonably good, considering the available personnel and funds. A broad program of range-watershed rehabilitation has been proposed recently to the Forest and Range Organization by the Watershed Management Bureau. Reportedly, this program would involve rehabilitation activities, over a 20-year period, on some 60 million hectares of watersheds and rangelands, including about 12 million hectares of sand dune areas and about 48 million hectares of other range-watershed lands. The broad outline of this rehabilitation program has received at least tentative approval at a high level in the Iranian Government.

It may be hard to justify expenditures for range protection and rehabilitation from the economic standpoint of their grazing value alone. However, the economic losses which will result from serious floods, reservoir and streambed siltation, and dust-storms are tremendous. When these elements are included, the value of restoring adequate cover on range-watershed lands will be clear, whether the lands are subsequently grazed by livestock or not.

Livestock Driveways

When livestock operators begin trucking their livestock, they will be faced with paying costs of the trucks. Government assistance to these operators will be essential at least for five to ten years. One form of help could be subsidies or incentive payments directly to the livestock operators to cover trucking costs. An alternative approach would be Government payments to the truck owners and drivers. A third but less desirable possibility would be for the Government to purchase trucks and hire the necessary drivers to operate them.

Some of the truck hauling would involve long trips. The Government's provision of feed and water along the road would be appropriate.

In lieu of such long truck-hauls, it may be desirable in some areas to arrange for other livestock, based closer to the summer ranges involved, to use the ranges without being trucked. In such cases, alternate arrangements would be needed for present range users.

Classification and Identification of Grazing Lands (Vol. 1, p. 11)

His Imperial Majesty exercised needed leadership in calling for the initiation of a multi-faceted National Land Reform Program. Later related legislation and regulations have included the Land Reform Law (as amended), the Forest and Range Nationalization Law (as amended), and the Forest and Range Protection and Utilization Law (as amended).

One key aspect of the National Land Reform Program is the classification and identification of the National Rangelands and village lands which are and will be used primarily for range livestock grazing. (In this report, we use the term National Rangelands to refer to the national rangelands or nationalized pastures as defined in article 1, sections 7-9, and article 2, of the Forest and Range Production and Utilization Law.) However, the classification and identification of the National Rangelands and village lands is far from complete. Furthermore, this program has been progressing slowly.

Failure to speedily complete the National Rangeland and village land classification and identification program will have some serious consequences. Until such areas are so classified and identified, actions under article 55 of the Forest and Range Protection and Utilization Law, to stop intentional trespass by farmers and others, cannot be properly supported. Also, until the boundaries are clearly posted on-the-ground, considerable trespass likely will continue. The Forest Guards, provided for in article 22 of that Act, will lack a sound basis for protecting National Rangelands and village lands, until these men are able to tell where such areas are.

During a recent seminar, the Forest and Range Organization took a critical look at the situation. The Sarjangaldars from all Ostans participated. Reportedly, a crash program was agreed upon to complete the mapping, classification, and written identification job within seven years.

Lack of adequate base maps for the areas involved has been a key bottleneck. Plans approved at the seminar call for the prompt formation of about 20 three-man teams per Ostan, adequately trained and supervised by qualified engineers, to complete this mapping job in the next seven years. Reportedly, classification and identification is to be finished for the area involved immediately after each map is completed. It is essential that adequate funding, recruitment, training, and other activities are provided to carry out all plans on schedule.

Personnel carrying out this National Rangeland identification program are subject to strong pressures to delay identification in certain areas or to misclassify lands for the benefit of private persons. Therefore, it is essential that the crash program include the assurance of effective procedures, not only to enable employees to withstand such improper pressures but also to minimize delays resulting from such pressures.

Reportedly, no provision for on-the-ground boundary posting was established at the seminar because of the expectation that boundary markers might be moved or destroyed. However, there is convincing evidence, in many other countries, that if such actions are made illegal and adequate penalties are consistently enforced, this problem need not be serious. Therefore, we recommend the adequate marking of National

Rangeland and village land boundaries and providing reasonable assurance that such markings are not moved or destroyed.

Close and sustained coordination among personnel of the Land Survey and Distribution Bureau, the Forest and Range Engineering Bureau, the Range Management Bureau, and the Watershed Management Bureau is essential in carrying out the crash program. It is suggested that a work group including representatives of all four agencies be set up to give continuing attention to this program.

We also suggest that one of the deputies to the Deputy Minister for Forests and Ranges be designated to stimulate and guide the proposed work group and to follow up on its progress in developing and carrying out a crash program.

Cultivation of Marginal Lands (Vol. 1, p. 13)

Iran needs to raise more cereals, particularly wheat and barley. Dryland cereal production on some lands where slope, soil, and climate are suitable for permanent agriculture may be desirable, even though this results in reduced carrying capacity for range livestock. But too often, dryland cereal production also has been carried out on marginal lands.

Often, such lands produce only meager crops of cereals. Sometimes, complete failures of plantings occur. Some of this work has been done with tractors and steel plows resulting in more permanent damage than is caused by primitive oxen and wooden plows. Many plowed areas are on steep slopes or thin soils where permanent ground cover is essential to avoid serious watershed damage or they are in arid or semi-arid areas. Often, such marginal lands are soon found to be worthless for cereal production and are abandoned. This land, particularly if it has been plowed deep with steel plows, may take decades or centuries to develop again a cover of native range plants. In any event, marginal lands generally are unproductive areas which are a significant source of erosion, floods, reservoir and streambed siltation, and dust storms. Even where cereal production is reasonably good, the damage to range-watershed values and the disruptions to livestock grazing make dryfarming an undesirable practice on such lands.

Legislation Needed

A solution to the problems caused by dryland cereal production on cultivated marginal lands is urgently needed. The first step in such a solution is the development and enactment of legislation which defines marginal lands and prohibits dryland cereal production on these lands which do not need specified minimum standards for slope,

soil depth and erosiveness, and climate. This legislation could appropriately amend Article 42 of the Forests and Ranges Protection and Utilization Law. It is suggested that in this legislation, marginal lands be defined to prohibit dryland cereal cultivation on slopes exceeding 20 percent, on soils with depths less than two feet, on erosive soils, and on arid and semi-arid areas where average precipitation is less than 200 millimeters per year. (The numbers suggested are value judgments based on the team's observations in Iran and experiences elsewhere. If key personnel in the Watershed Management Bureau and Range Management Bureau can provide sound figures supported by Iranian experience, this would be desirable.) Penalties for willful violations of the law should be severe and enforced.

Notifications

In some cases, persons who are cultivating marginal lands may claim ownership to them by virtue of their cultivation being initiated before land reforms were started. In such cases, aerial photographs taken before or shortly after the enactment of land reform laws might be useful in resolving disputes about when cultivation began.

In some areas, dryland cereal production on marginal land may be the primary activity of a community. In such situations, prohibition of further cultivation of such land may result in serious employment and financial problems. In such areas, a provision for the Government to provide some alternate source of employment and income (such as in range watershed protection, rehabilitation, and improvement programs) may be appropriate to reduce the adverse side effects of the prohibition. It may be desirable to move some marginal farmers to other areas at Government expense.

The work group responsible for policies and actions on marginal lands should develop plans for notifying villagers and farmers about the undesirability and illegality of marginal land cultivation. It also should establish detailed provisions for compensation or employment of previous cultivators. In addition, the work group should develop instructions relating to enforcement.

Responsibility needs to be assigned to an appropriate Government agency to handle notification of the cultivators. The team recommends the Extension Service (see Vol. 1, p. 14, item f. iv.) But since the Range Management Bureau and Watershed Management Bureau are vitally concerned with effectively stopping marginal land cultivation, the Ministry may find it preferable to assign the notification job to one (or both) of these agencies. The notifications themselves should be carried out promptly when the lands are identified.

Rehabilitation

After the marginal lands are properly defined and identified, it also is essential that they be promptly rehabilitated. In some cases, site deterioration may be virtually irreversible. In many cases, however, a permanent ground cover suitable for watershed protection and eventually for livestock grazing may be developed. In some areas, such cover can be restored by seeding or planting of suitable range-watershed species. In other areas, seeding and planting may be impractical.

Specific data are not available to indicate the magnitude of the restoration program. However, from observations in many parts of Iran, it is estimated that several million hectares may be involved.

A work group made up of appropriate qualified representatives of the Range Management Bureau and Watershed Management Bureau should be designated to plan the rehabilitation program.

Low Productivity of Rangelands (Vol. 1, p. 18)

Rangeland productivity in Iran is far short of the potential. The major cause is rangeland overuse. The current range management and improvement programs are wholly inadequate to improve utilization and maximize productivity of rangelands.

"Transitory range management planning" is an excellent approach developed by the Range Management Bureau to initiate conversion from the previous system of range use without formal plans to a new grazing system based on advanced range management plans. Difficulties in such a shift include lack of adequately trained technicians, inadequate permittee understanding, enforcement difficulties, and social problems.

The Bureau's transitory planning involves two basic stages: (1) grazing permit issuance; and (2) range management planning.

Issuance of grazing permits is designed as a first step to establish tentative grazing capacities for various National Rangelands. Permitted numbers and seasons are determined by reconnaissance with minimum technical help. Such permits are a relatively simple way to begin gaining a degree of needed control of livestock use. About two thirds of the 100 million hectares of National Rangelands are covered by these permits. Initiation of the permit system reportedly is under way in all Ostans.

It should be made clear to all permittees involved that the use of National Rangelands is a privilege rather than a right. Obviously, public rangelands have substantial forage values for livestock owners. It would appear reasonable for the Government to charge grazing fees for the use of such lands and forage. However, the overwhelmingly urgent need is to reduce range use to current carrying capacity. This will require much of the efforts of Range Management Bureau personnel

for the next five to ten years. After the range reduction program is operational and relatively trouble-free, it will be time to consider a grazing fee system.

Livestock owners who lack adequate forage for their livestock during periods they are not permitted on the rangelands usually have great difficulty in adjusting their use in line with the carrying capacity. Therefore, it is highly desirable that anyone applying for a grazing permit be required to own or have long-term tenure for some reasonable minimum amount of base property (such as lands producing livestock forage). Livestock owners who hold permits previously issued without meeting such a requirement should be required to meet it within a reasonable period of time, or to transfer their permits to qualified livestock owners.

The second stage in the bureau's transitory range management planning is the development of short-term range management plans. Before such plans can be developed, range surveys and analyses must be completed for the areas involved. This includes reasonably complete and accurate data on: livestock numbers; rangeland areas, types, locations, conditions, trends, capabilities, availability, and suitability; rangeland uses, existing and potential, by livestock, wildlife, and other users; and range carrying capacity. Such data are secured through range surveys. Presently available data for most specific areas are generally incomplete.

An extensive nation-wide range survey was completed in 1973 and 1974 for MANR by FMC consultants. The Ministry's prompt and sustained action in getting this study made is highly commendable. This survey was based on the use of Earth Resources Technology Satellite (ERTS) information, coupled with on-the-ground checks and measurements. The survey makes available considerable data on range vegetative composition, productivity, condition, and grazing capacity. Necessarily, due to the short time frame covered by the FMC contract, this information is largely extensive rather than detailed and precise. Generally, data are not available concerning specific individual areas.

With the final FMC report now available, it is timely for the Ministry to examine the range survey data developed. This will help the Ministry to determine what data are applicable in making the necessary detailed on-the-ground range surveys and analyses throughout Iran for use in range management planning. It will also help the bureau and Ministry to determine whether additional significant range management values can be captured by securing ERTS data periodically. For example, the bureau is currently considering the use of ERTS photos in a stepped-up project of rangelands boundary identification and range condition classification. Some substantial added benefits would result from such types of continuing use of ERTS programs in range management. However, large-scale, low-elevation aerial photos will be essential for range management planning.

A very difficult job is the making of detailed on-the-ground range surveys as an essential forerunner to completion of range management plans. This job has been underway in commendable fashion in the Range Management Bureau for several years. But, because of Iran's great size and complexity and the limited number of technicians available, the rate of progress on this program is far too slow to meet the nation's needs. The current rate is about a half million hectares per year, which will require more than 100 years to complete with presently available personnel. To complete sound range management plans in five years, faster progress on range surveys and analyses is essential.

Range management planning, to date, has largely been done by Range Management Bureau personnel working out of the Tehran central office. Tentatively, the bureau intends to shift this activity from Tehran to the Ostans. Thereafter, the national office will provide needed supervision and expertise to the provinces. This decentralization appears to be highly desirable. It should increase productivity.

Since 1969, Range Management Bureau specialists from Tehran reportedly have prepared thirteen of these range management plans, covering nearly 2 million hectares, based on national priorities. Obviously, this leaves about 98 million hectares of rangeland where this planning is not completed.

We recommend that high priority be given to this job. Until completed, it is a bottleneck in the development and carrying out of sound programs for range management, rehabilitation, and improvement.

Recently, the Ministry has recognized the urgent need for greater progress in range surveys, analyses, and management plans. Arrangements are being developed to contract some of this work with one or more private consultant firms on a pilot basis. Expatriates as well as Iranians may be used. This approach is to be expanded if the resulting data and plans are satisfactory.

This innovative attempt has the potential for developing the needed survey data and plans at a sharply increased rate. To succeed, it will require: (1) range management consultants who are well qualified, by education and experience, to do this technically complex job; (2) close coordination with responsible Range Management Bureau personnel who must supervise closely; (3) close coordination with the concerned livestock operators, to assure that their views are considered; and (4) establishment of deadlines. A more detailed team report concerning this approach has been furnished to the Deputy Minister for Forests and Ranges at his request.

In scheduling the range surveys and analyses and the development of range management plans, it is essential that such work be completed first on areas in poor condition. This will facilitate improvement of such conditions.

Range management plans made to date are generally on the shelf rather than being initiated. A key reason is that the range users concerned did not participate in developing the plans, so they are not committed to following them. Past experience elsewhere indicates that, unless the desires and needs of the users are considered, the difficulty of carrying out the plans is greatly increased. Of course, it will not be possible to accept all desires of users.

But these desires should be understood and accommodated as fully as is sound, to increase the users' acceptance of the plans. Often, too, the users may have some suggestions which will make the plans better and more practical.

Initial range management plans will need to be updated and refined to link range use with related agricultural cropping. Such refined planning will need to be deferred (except perhaps on a pilot basis) until transitory planning is essentially finished.

Until range management plans are developed, the benefits of planning will be limited, in varying degrees. Considering the generally poor condition of Iran's rangelands, it is important that these plans be developed and applied, nation-wide, as soon as possible. As quickly as the initial range management plans are completed for individual areas, the actions needed to carry them out should be promptly initiated and aggressively pursued.

The Range Management Bureau has had some very good results in a number of previous range improvement projects. A great deal has been learned which will be helpful in conducting a larger-scale program. Already some specific planning is well along for very sizable range management and improvement (and other livestock development) activities in the Kermanshah and Fars areas.

So far, little attention to various range pests has been feasible in the Range Management Bureau. Consequently, range rodents, insects, diseases, and poisonous or noxious plants are largely uncontrolled. Such controls would result in substantial range benefits. However, this work generally has lower priority than other range improvement activities, at least for the next few years.

As range improvements are made, on individual users' rangeland areas, Range Management Bureau personnel in the central office and the Ostans need to assure that these improved areas are properly used. To the extent feasible and appropriate, they primarily should be utilized, on a continuing basis, to reduce livestock pressures on deteriorating rangelands.

A pilot project to test aerial application of fertilizer on rangelands is being developed in the Range Management Bureau. Through such trials, various programs and activities can be thoroughly tested. This avoids eventual misapplications and helps to assure that future attempts are productive.

Some may assert that an intensive range improvement program can result in a much greater carrying capacity much faster. Possibly this is correct. In any case, the plan should be to utilize all additional range capacity that can be developed without adverse effects.

Over optimism based on initial results must be avoided. Often, improved areas initially look their best and are stocked accordingly. When production falls off, overgrazing results. Conservative initial stocking is essential. Sustained range capacity is vital to any permanent buildup of livestock numbers.

The needs and values of rangelands for other purposes, including watershed, wildlife, recreation, and environment, must be kept in mind in all range management and improvement plans and programs. Such needs will sometimes necessitate substantial changes in range activities.

Sound range management practices such as rotation grazing, rest-rotation grazing, and loose herding should be utilized. In many cases, good management of livestock on rangelands may be far more valuable than a range improvement project.

Rangelands in Iran contain sizable forage resources. Over the centuries, the tribes have developed significant range management and livestock management skills. To attain maximum production of livestock in Iran, large areas of rangelands containing important forage resources need to be used by tribal livestock. Otherwise, such areas will not be properly used. Many opportunities, as well as some constraints, relate to desirable aspects of tribal livestock use.

The Range Management Bureau seems to be generally staffed by hard-working, conscientious employees. The size of this work force, however, falls far short of meeting needs. The bureau has been commendably active in trying to broaden the experience and knowledge of deserving employees by providing training opportunities. With the support of the Forest and Range Organization, the bureau this year has initiated a very promising program called "Investment in Human Power" involving Government sponsored and financed additional college education in range management for at least one year in the United States for key bureau personnel. This program is designed to provide such an opportunity to about ten employees per year for five years (a total of about 50 key men). The first year's quota has been met.

In addition, over 30 employees of the Range Management Bureau have participated in short-term training tours in various parts of the world. These tours have been designed to provide on-the-ground observation of other nations' approaches to dealing with range management problems. These are splendid steps in the right direction. But a much expanded program of recruitment and training is needed in the bureau.

One yardstick for measuring the size of the need for added professional and technical staff in the Range Management Bureau is a comparison with comparable staffing in the United States. There, the Forest Service in 1973 had an estimated 500 to 550 range-trained employees in professional and technician-type assignments. The Forest Service administers about 42 million hectares of lands in grazing allotments (of which about 20 million hectares are classed as suitable range). The Bureau of Land Management (BLM) with about 340 range-trained employees in 1972 administers some 68 million hectares in the conterminous 48 states (of which about 60 million hectares are suitable range.) Thus the average Forest Service range conservationist has responsibility for about 84 thousand hectares in range allotments (about 40 thousand hectares suitable for grazing). The BLM range conservationist would, on the average, handle a total of about 200 thousand hectares (about 175 thousand hectares suitable). Thus, the average range conservationist in these two agencies would have responsibility for about 130 thousand hectares of rangeland (or about 95 thousand suitable hectares).

In Iran, there are about 158 range-trained employees in the Range Management Bureau who have graduated from either the Goran Forest and Range Technical School (now a two-year school) or from some university in Iran or elsewhere. With about 100 million hectares of rangelands to administer, each such employee has responsibility for about 630 thousand hectares. If 71 million hectares are suitable, each employee is responsible for about 450 thousand suitable hectares.

To be on a par with the United States (assuming all other factors are comparable), Iran would require a total of over 750 range-trained employees in the Range Management Bureau. This amounts to a five-fold increase.

Furthermore, the need for an even larger increase in Iran may well be in order. U.S. agencies recognize a need for more range-trained personnel to fully handle the job in America. Their employees are generally university graduates so their backgrounds would be better than the average Iranian's. Also, the range management job ahead in Iran is tremendously complex. All things considered, it appears certain that, if the Ministry could instantly recruit, educate, and train 600 range conservationist employees in the Range Management Bureau, they likely would still find more work of a high priority to be done than they could do.

Such an increased Iranian work force is urgently needed. Until it becomes available, and this may require several years of aggressive effort, the use of well trained expatriates from various countries with range and livestock situations similar to Iran's provides a logical interim opportunity. Possibly these expatriates could fill two major roles: (1) giving counsel to Iranian counterparts and others who lack

experience but have responsibilities for such programs and (2) actually supervising certain project type activities, where Iranian supervisors are in short supply.

A key point to keep in mind is that, for most expatriates, it will likely take at least six months and possibly a year to understand the Iranian situation well enough so they can be really effective. Therefore, assignments ordinarily should be for at least two years and preferably longer.

A work group with representatives of the Range Management Bureau, the Watershed Management Bureau, and the Personnel Management Bureau should, within the next three months, develop a broad-gauge, long-range program for recruiting, educating, and training Iranians needed to do the range management job. This work group should also determine the needs for expatriates, and develop a program for their recruitment and utilization. Both programs should be promptly initiated and aggressively pursued. The recent agreement developed by the Iran/U.S. Joint Commission should greatly facilitate the recruitment of qualified expatriates to meet the needs identified.

Someone may logically wonder whether it is worthwhile to go to all the effort of carrying on a large-scale range management and improvement program, when the resulting gains in carrying capacity for livestock may be relatively modest. According to FMC, it will be possible to increase the present capacity of 11.3 million sheep units to about 14.5 million sheep units. This increase of about 3.2 million sheep units will require a sizable expenditure and effort over a 20-year period.

Is it worth it? Both the present carrying capacity and the estimated future carrying capacity fall short of the number of livestock presently grazed on the rangelands of Iran. Yet, with range conditions and other limiting factors as they are here, it appears unrealistic to expect a markedly greater increase will be feasible at least within the next 20 years unless a tremendously stepped-up range management and improvement program is promptly launched and aggressively pursued. However, in the light of Iran's growing need for red meat and other livestock products, it appears essential that every reasonable effort be made to increase carrying capacity for range livestock.

B. FORAGE AND FEED PRODUCTION (Vol. 1, p. 21)

The preceding section emphasized the depleted condition of range-land. This section focuses attention on production of animal feed from cultivated land. Iran must rapidly expand production of forage and feed on cultivated land, in order to take pressure off the range. Problems center on (1) forage and feed supplies, (2) feed production on cultivated land, (3) irrigation resources, and (4) utilization of by-product feeds. Following is a more detailed discussion of these problems which are outlined in Volume 1.

Forage and Feed Supplies (Vol. 1, p.22)

If cropland is to rapidly increase its contribution to animal feed, five specific lines of action should promptly be taken. Each line of action can make a significant contribution, and all are necessary if maximum relief of rangelands is to be obtained. We recommend careful consideration of each, and propose that action be started on a significant scale without waiting for completion of detailed analysis and the preparation of major plans.

Minimum Price

The offer of a minimum price for forage and feed probably would do much to stimulate production. The uncertainties of market opportunities are frequently cited as a primary reason why farmers are hesitant about planting forage crops. A guaranteed minimum price high enough to make forage a cash crop competitive with alternatives available to the farmer would remove that uncertainty. Government buyers should purchase the forage in the field and transport it to some pre-determined place for storage. In times of need, when purchased by livestock owners, the Government should be prepared to deliver where needed. The agro-industry complex, with a very large development at Marv Dasht, has contracted with eight farm corporations near there for alfalfa hay at 6,750 rials per ton. On December 1, 1974, alfalfa in that area was selling at 10,000 rials per ton. This is good evidence that the Government would not lose money on a guaranteed minimum price, because in times of shortage, when the Government would sell, the price is high. If the Government, in years of feed shortage, sold at only slightly above the guaranteed minimum price, this action would have a stabilizing influence on the price of forage. This program should add stability to the livestock industry. Other forage crops, such as maize and sorghum, should also come under a guaranteed minimum price. The guaranteed minimum price should not be subject to change on short notice, but should be adjustable to keep in balance with current prices generally.

Incentives

A second line of action would be an incentive program or requirement for livestock producers to produce or buy feed for his own stock, perhaps enough to supply each sheep unit of livestock owned. Such a requirement would have several advantages: (1) it would provide for every livestock owner a source of feed for proper (or better) nutrition of his animals to be used during periods of the shortest grazing supply, usually in the winter; (2) by contributing feed for his own animals, through his own effort, the livestock owner would become more aware of the nutritional requirements of his animals, and the relationships between nutrition,



growth, health, and profitability; (3) the requirement from any one livestock owner would not be great, but the total contribution to livestock feed requirements would be considerable, and equitably distributed; (4) villagers, who know their neighbors' land and livestock numbers, would know whether each livestock owner was conforming to the program. The otherwise difficult job of enforcement would thus likely be largely handled by the villagers themselves, with a minimum of government involvement; (5) each village could, if it chose, pool its resources for more efficient operation by having a single large field of alfalfa, or other forage crop, and could conduct its winter feeding at a village feedlot. This would release quite a few men during the winter to work at other types of employment as available.

Incentives for Irrigated Lands

A program, again based either on incentives or regulations, to ensure that a specified percentage of all newly irrigated land will be planted to forage crops would: (1) increase the supply of forage in proportion to the rate at which new land was brought under irrigation; (2) assure livestock owners who may not be able to meet their feed requirements on their own land that there would be a source from which they could purchase it; and (3) the forage crops grown would add organic matter to the soil (soils of Iran are generally very low in organic matter). If these forage crops were then made part of a crop rotation, they would eventually contribute toward higher yields of all crops.

Land Trades

In order that the tribes, who own no land, might participate in the program for producing forage, the Government should trade land to the tribes for sheep. The land the tribes might thus acquire could be a collective base for feed production. It could be fed at a tribal feedlot where the tribe winters. In order to displace no one, the land involved should be that brought into production by new irrigation projects. The nomads could hire both land and feedlot management, if they did not provide it from their membership. If the land was capable of producing 7 tons alfalfa hay per hectare, one hectare would provide 0.2 tons for each of 35 sheep-units. If the average sheep traded weighed 40 Kg. and was worth 65 rials per Kg., the land would take on a value up to 91 thousand rials per hectare, depending on values assigned to labor and other inputs.

Seeds and Fertilizers

The Government should provide seeds of adapted species of forage crops and fertilizer to farmers at discount prices. The MANR Impact Program is doing some of this, but by 1972 it had covered only 17 percent of the area sown to forage crops, and it is not dealing with all the forage

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crops of importance to Iran. The Impact Program does not appear to be markedly influencing the trend of Iranian agriculture toward the production of more forage from cropland. This program needs to be substantially enlarged, and given the authority to be more influential in determining what crops are grown. This could be done by the program through its control over seed importation.

Iran also needs an independent, thoroughly modern, and scientific seed certifying agency, with leadership that promotes, within Iran, the production of certified seed of every variety and species of crop plant important to Iranian agriculture. Plans for the establishment of such an agency should be vigorously pursued.

Feed Production on Cultivated Cropland (Vol 1, p. 24)

Iranian farmers obtain low yields per hectare from cropland. Cereals, primarily wheat and barley, occupy nearly 80 percent of the land and yields have not increased appreciably in recent years. Until cereal yields can be increased, additional land on which to grow forage will have to come from new land brought into production by irrigation projects. This avenue is far too slow to meet the present need. The following statistics have been published by the Ministry:

	<u>1960</u>	<u>1968</u>	<u>1970</u>	<u>1971</u>
	(tons of grain per hectare)			
Wheat: irrigated	1.18	1.28	1.43	1.30
non-irrigated	.48	.64	.57	.43
Barley: irrigated	1.15	1.59	1.39	1.24
non-irrigated	<u>.51</u>	<u>.62</u>	<u>.64</u>	<u>.41</u>
Mean yield, by years	.83	1.03	1.01	.85

These very low yields demonstrate that Iranian farmers are not efficient wheat and barley producers, even though they have been growing these crops for centuries. If farmers understood, and were able to follow well established and widely used practices, there is little reason to doubt that yields per hectare on irrigated land could be doubled and, on rainfed lands, significantly increased. Farmers would welcome the needed information, but it has not been given to them. The problem does not exist with cereals alone. To a greater or lesser degree it applies to all crops. Increased yields per hectare can be brought about by the

general use of improved varieties having higher productive potential and by the widespread application of other improved technology. Only when improved seeds are combined with other new inputs or practices are maximum benefits possible. This is true because the high yielding varieties owe their superiority to their ability to make greater response to specific practices than can old varieties. The Mexican wheats have restricted application in Iran because they are not very winter-hardy. But the locally bred variety "Omid" and the Russian variety "Bezostaya" are both excellent in the cold-winter parts of Iran. Actually, these varieties have not come much into production in Iran.

The Impact Program, charged with the introduction and spread of good seed had, by 1972, according to Abdullah, (1974) become involved in only 8 percent of Iran's wheatland, and considerably less than 1 percent of the nation's seed wheat requirement was locally produced under its sponsorship. The Impact Program is young, and growing, and will eventually have an impact on the crop production of Iran. Its activities should be accelerated.

Education Programs

The problem thus facing the MANR is to get to all the farmers the information they need to enable them to increase sharply the yield of cereals per hectare. If the cereal needs of Iran can be met on fewer hectares, more land will become available on which to grow forage. As rapidly as it can be launched the MANR should undertake a massive farmer education program, concentrated on wheat and barley, but applicable to all crops. Ideally, this would involve putting into the field several thousand well-trained and experienced agricultural extension agents. These are not now available, and will require years to train; therefore, other means must be found. Fortunately there are other means, and they can be effective, if properly managed.

The program that is proposed would be carried out by radio, supported by publications. It would use whatever field demonstrations the present extension service could manage. The primary advantage of the proposed method is that it can be launched at once, because Iran probably already has enough highly trained men who know the crop regions being planned to provide the needed information. These men would come from the ministries and universities throughout Iran. These men would be located in a strong central extension office in each region, and would prepare material for weekly broadcasts to every farmer in the region. The contents of these broadcasts would then appear in print, either as separate publications or as articles in a farm journal issued frequently.

Regardless of the form in which it appeared, the goal would be to send the information to every farm family. Iran is still struggling with problems of illiteracy, but literacy is increasing and it is likely

that most farm families by now have one member who can read. All information for this purpose must be prepared on the farmers' level, and geared to the tools he has. Regardless of the form of the published material, it should be attractive and generously illustrated. If publication was in a regional monthly farm journal, it could also contain other information of interest and value to farm families, such as advice on sanitation, health, homemaking, child care, clothing, notice of radio programs, government subsidies to agriculture, market quotations for agricultural products, etc. These additional programs would require other trained people. If such people could not be recruited at once, this is a goal toward which each region might work. As rapidly as trained agricultural extension agents could be produced, they should be located where they could give personal attention to farmers' problems.

To launch a program that will make an immediate impact on farmer practices and resulting yields, all farmers must be given instructions for every step of production. Every practice advocated must be that which will lead to maximum yields when performed correctly and at the right time. The following is only a suggested partial list of subjects.

- Seedbed preparation
- Fertilization
- Importance of clean seed
- Seeding
- Irrigation
- Weed, insect, and disease control
- Harvesting
- Sources of credit, and their proper use
- Importance and methods of crop rotation
- Importance and methods of clean fallow
- Proper methods of grain and seed storage
- How to market the crop, and when
- Erosion control
- Seasonal schedule of time use

The educational process should explain to farmers why the new practices are being proposed, primarily in terms of expected higher yield, and what that will mean to Iran, and to themselves.

Studies by Van Der Wal and Shamsai ^{1/} in Iran have shown that very high yields of forage crops are possible where there is a good water supply. They report the following yields from the Central Province, which have been converted to total digestible nutrients (TDN) for comparability:

^{1/} See bibliography

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See this report

<u>Crop and conditions</u>	<u>Tons TDN/ha</u>
Maize, mean of 6 varieties, fertilized	12.7
Maize, mean of 23 large dairies, Tehran area	11.0
Maize, mean of 4 areas, fertilized	10.9
Sorghum x sudangrass, fertilized	10.5
Fodder sorghum, best variety, fertilized	9.7
Fodder beets, mean of 7 varieties, fertilized	9.0
Maize, mean of 6 varieties, not fertilized	8.9
Grain sorghum, 2 best varieties, fertilized	8.4
Sainfoin, good for 2 years	8.0
Sudangrass, fertilized	7.9
Fodder beets, mean of 7 varieties, not fertilized	7.1
Alfalfa, mean of 4 areas, best practices <u>1/</u>	7.0
Pearl millet, in July and August, following grain	5.8
Persian clover, Dec. to May, seeded in grain stubble <u>2/</u>	

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- 1/ The mean yield of alfalfa in the Central Province is 4.4 tons TDN/ha.
- 2/ Persian clover yielded 28 tons green weight/ha, estimated to be 4 tons TDN
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These data show that in the Central Province maize, sorghum x sudangrass, fodder sorghum, fodder beets, grain sorghum (though subject to severe bird damage), sainfoin, and sudangrass all yielded more TDN per hectare than alfalfa. It is reasonable to expect that in other parts of Iran having ample water and a comparable growing season, similar results would be obtained. Alfalfa is near the bottom of the list, but it should be noted that 7 tons TDN per hectare is a 100 percent increase over yields reported by the Ministry for 1970-71. Alfalfa, however, is a very valuable, high-quality feed and its cultivation in Iran should be greatly expanded.

There is good evidence, as reported for Iran and worldwide that maize, if its water and fertilizer needs can be supplied, is capable of producing more tons of TDN per hectare than any other crop, with sorghum a close second. Sorghum is highly productive where water for irrigation is less plentiful than required for maize, or where its availability is subject to greater uncertainty. Only a half-hearted effort is being made to promote either maize or sorghum in Iran.

FAO Production Yearbook statistics report that, in 1961, Iran grew maize and sorghum, respectively, on 16,000 and 10,000 hectares. By 1972, the use of these crops had increased to 25,000 and 12,000 hectares, respectively. The percentage increase in maize during this period is about equal to that of wheat. Sorghum barely increased at all. The agriculture of Iran would be in a much stronger position today had these crops increased 10-fold, or even more, during the 12-year period.

Crop and Condition

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 Fodder, 1931, 7.5
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The provision of whatever incentives are necessary now, to rapidly promote maize and sorghum, for both grain and silage, wherever there is sufficient water to grow them, are actions important to the survival of the range and village livestock industry in Iran. Crops such as soybeans should be expanded, but not with the aim of substituting vegetable for animal protein.

Water is a critical issue in the national need for more forage. Farmers with a limited water supply, or with water restricted to late spring and early summer, probably should be encouraged to remain cereal growers. Those with a better water supply should be encouraged to shift to forage crops. Throughout Iran, the water supply will be increased as canal and head ditch lining and other water-conserving practices are brought into widespread use. The use of fertilizers must be greatly increased on irrigated land. Fertilizers not only increase crop yields, they also increase the efficiency of water use. In the yields from the Central Province, reported above, six varieties of maize with fertilizer yielded 3.8 tons TDN per hectare more than the same six varieties without fertilizer. It is believed that the additional water needed for the higher yield was not nearly proportional to the additional yield obtained. This illustrates the improved water use efficiency that can result from use of fertilizers. Yet, in 1971, the main crops--wheat, barley, rice, cotton, and sugar beets--were given only 20 percent of the fertilizer they should have had for best results. Leguminous crops, when properly inoculated and nodulated, will generally respond most profitably to phosphorus fertilizer, while non-leguminous crops generally respond best to nitrogen. Water must not be too limiting a factor.

Double cropping should be practiced wherever the climate and water supply will permit. Both Persian clover and pearl millet have been double cropped. These crops had the lowest water requirement per ton TDN produced. The Impact Program should encourage double cropping by providing seed and fertilizer at discount prices. The Fifth Plan calls for double cropping to be applied to 150,000 ha.

Credit

The need for more credit for small farmers has been recognized by His Imperial Majesty the Shah and still exists. Sources of credit for small farmers should include a counseling service to help educate the farmers on the proper uses of credit.

Land Leveling

Farming systems that permit the land to be leveled and farmed in large fields should be promoted wherever the land is capable of being leveled. This will make possible the use of modern labor-saving equipment, and more efficient use of water. Modern water distribution systems should be developed as rapidly as possible.

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Land Leveling

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A considerable part of the agricultural land of Iran is not capable of being leveled into large fields. To the very greatest extent possible, such land should be used for intensive crop production, specializing in fruits, vegetables, or flowers, or in seed production of specialty crops. This will help farmers on small holdings to improve their level of living. Such farmers should be given every possible assistance in the educational program.

Winter wheat production on rainfed land in Iran is a very marginal activity, with average yields scarcely above a half ton per hectare. Furthermore, wheat production has encroached upon rangeland, contributing substantially to the critical condition of rangelands, and affecting adversely both the range and village livestock industries.

Research

There is urgent need for research on the value of a clean fallow as compared to the abandoned fallow used widely in Iran. In the southwestern United States, in a climate approaching much of Iran, Leubs ^{1/} reported that a clean fallow conserved from 13.1 to 23.6 percent of the annual precipitation (347 mm) for the next year's crop. A comparable saving in Iran would more than justify the clean fallow.

Irrigation Resources (Vol. 1, p. 26)

Extend Irrigation

In Iran there is more potential agricultural land than there is water needed to make it productive. It follows that water is generally the first limiting factor in crop production. It is imperative then, that every effort be made to (1) develop to its fullest the irrigation water supply of the country, and (2) distribute and use the water supply with maximum efficiency.

It is not within the scope of this report to explore for potential sources of water for irrigation, but only to point out that all water not otherwise used should be stored and used as needed in crop production. Iran's total irrigation water resource is claimed to be able to reach double the present irrigated area. If any part of the country has more water than needed, every effort should be made to transfer the extra water to areas where shortages exist. It is equally important that rainfall on cropland be conserved to the greatest extent possible by the use of water-conserving fallows or other means such as crops having a low water requirement.

Canal Lining

Engineers also claim that if the irrigation water presently available were efficiently utilized it would reach to one-third more land.

1/ See Bibliography.

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Bahrani 1/ reported for the Shiraz Valley:

"Thus, the results indicate an inefficient use of water during the process of conveyance and farm water application. If a good irrigation system with a reasonable efficiency is maintained, it is estimated that the total cultivated land areas of the valley could be increased by 50 percent."

If water is to be used with maximum efficiency, it would be necessary to line all canals and headditches, or convey the water to the land in pipes to prevent seepage and waste of water to vegetation along the banks. Necessary work is progressing, but needs to be pushed as rapidly as possible in every part of Iran. It presupposes that canals and headditches are properly located and correctly engineered.

Fit Water to Crop Needs

Maximum efficiency of use means also that the irrigator applies water where and when needed, but not to excess. Farmers have a tendency to over-irrigate, which is wasteful of water as well as harmful to the land. Much research will be needed to determine proper application of water because many factors affect it, such as the crop, the soil, the climate, the time of year, fertilizer use, salt content of the water, other crop needs, etc. As long as water remains the first limiting factor in crop production in Iran, research on how to use it with maximum efficiency must have a high priority.

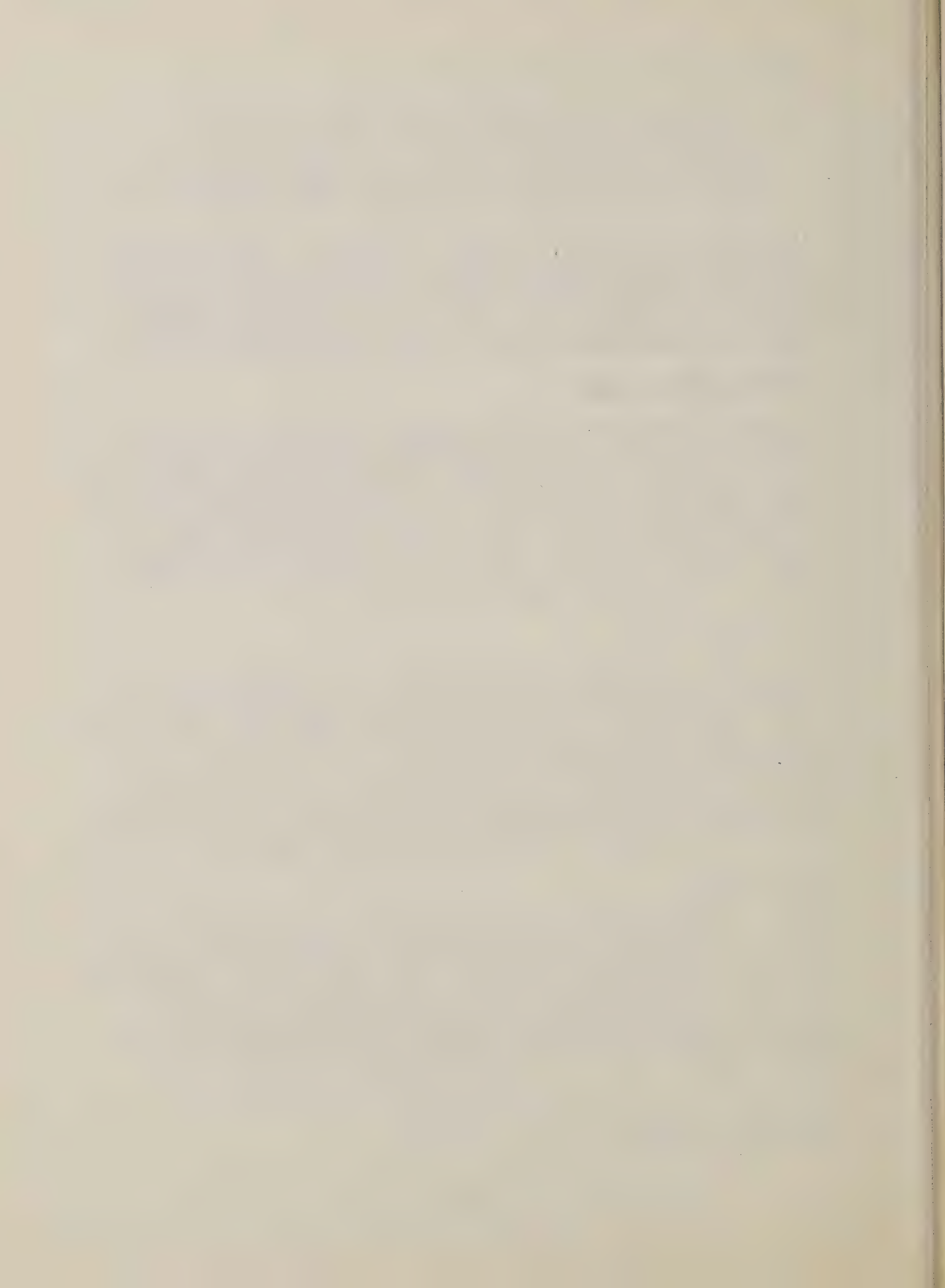
Water Table Problems

Some of the best agricultural land in Iran (and throughout the world) has been ruined by improper water management on adjacent higher-lying land. There is such an example in the Karadj area, where over-irrigation and seepage from canals and headditches raised the water table on lower-lying lands and greatly reduced their agricultural value. Over-irrigation can also foster root rot and other diseases, and leaches nutrients from the soil. Every irrigation district in Iran should be surveyed by soils and irrigation experts and immediate steps taken to prevent over-irrigation, including legal action if necessary.

Salt Problems

Iran's irrigation waters vary greatly in salt content. An FAO study (1970) 1/ reports that the tributaries of the Hablehrud River (the only important river serving the Garmsar plain) contribute only 2 percent of the water, but 44 percent of the salt. As a result, the river enters the plain with a salt concentration near the maximum tolerated for irrigation. Every effort should be made to divert the water from the salty tributaries away from the irrigation water that supplies the Garmsar plain.

1/ See bibliography



If salt-laden streams are found in other areas, they should be given immediate attention. Full advantage should be taken of new information on the use of salty water for irrigation, and Iranian research should clarify its adaptation to Iranian crops and soils. Considerable research is in progress by the Soils Institute, but most of its findings have not yet been applied in Iranian agriculture.

Research Needed

Research in Israel by Evinari (1961) ^{1/} has uncovered an ancient agriculture which provided water for crop production in areas where annual precipitation was only 100 mm. Runoff water during rainstorms was channeled to a restricted area of deep soil where crops were produced. Approximately 20 to 30 hectares of catchment were required to supply the water needed for one hectare of cropland. Small catchments yielded a higher percentage of the rainfall than larger catchments.

Soils that swelled upon wetting, thus restricting infiltration, yielded more water, and this was an important consideration in the establishment of runoff farms. Recent research (Hillel, 1974) ^{1/} has shown that water yields of catchment areas can be increased by both mechanical and chemical treatment of the soil. Iran has many topographical situations suitable to the application of water harvesting. This is a problem that merits the attention of soil scientists.

Some attention is being given in Iran to drip irrigation. It should be fully explored.

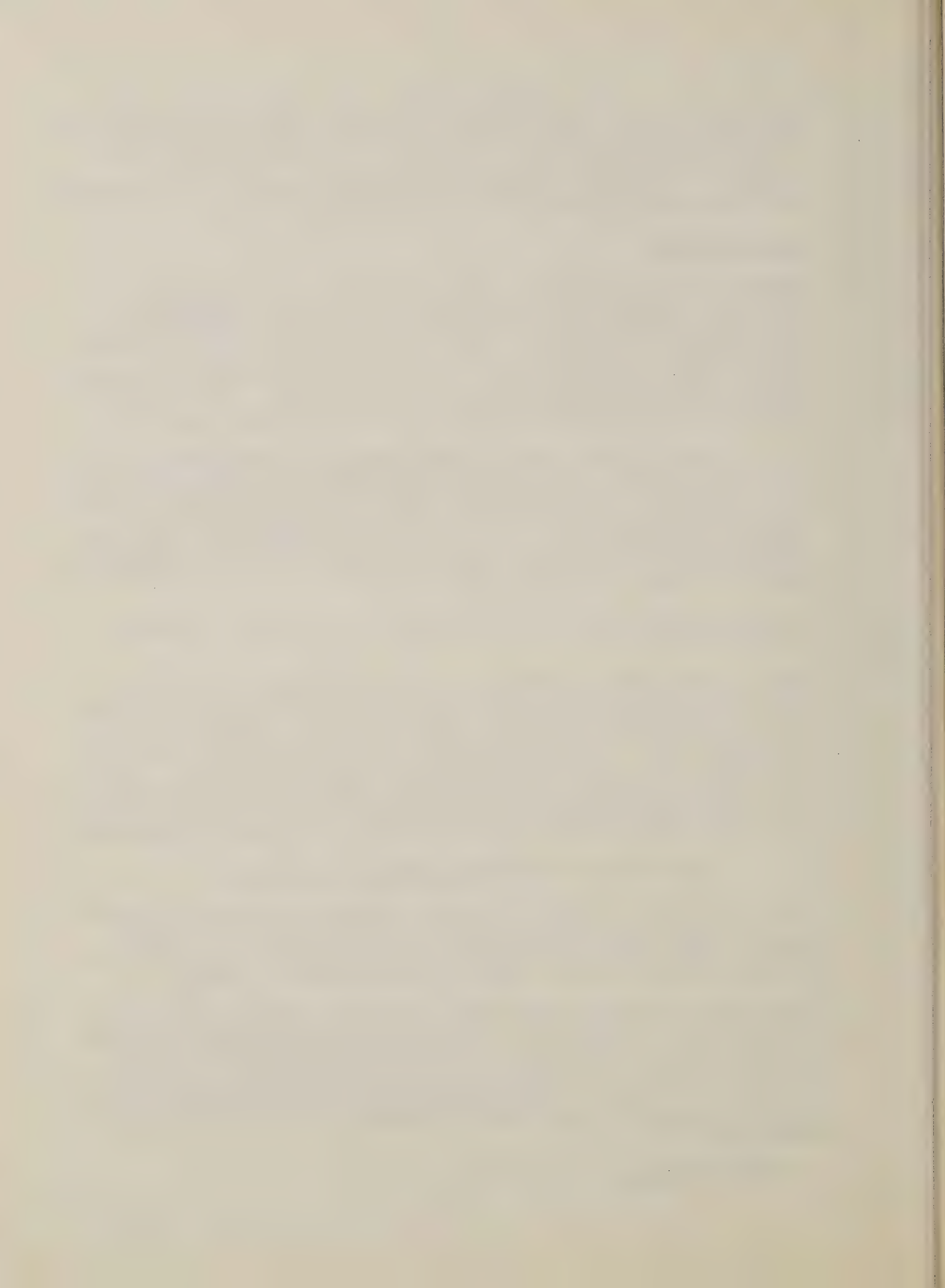
Gravel mulches have been found to save a considerable portion of the water ordinarily lost from the soil by evaporation. The use of a gravel mulch in areas where gravel is present in the soil, and need only be brought to the surface, might prove effective in orchards, and with some other crops, in reducing the irrigation water requirement. Recent attention to the problem of water for arid lands by a National Research Council committee (Peterson, and others, 1971) ^{1/} reported many potential methods for extending crop production into the drier parts of the earth.

Utilization of By-product Feeds (Vol. 1, p. 28)

There is currently no overall national inventory of by-product production in Iran, and no firm policy regarding its use as feed versus export. Several examples have been reported of procedures which are not in the national interest in view of overall feed shortages in Iran.

During the harvest season last year, over 50,000 tons of cane molasses were reportedly produced. All of it was reported to have been exported to Japan and the United States at a price of about 3900 rials per ton. Its feeding value varies with the type of ration in which it is fed and the type of livestock. However, when fed according to recommendations, cane molasses usually has a feeding value equal to 80 to 90 percent of maize grain.

^{1/} See bibliography.



At the time the exports were made, the quoted price for maize grain was about 9500 rials per ton, and that of barley about 8600 rials. The feeding value of the cane molasses was thus nearly twice the price at which it was exported.

Beet molasses has approximately the same feeding value as cane molasses. Some beet molasses is said to be exported at low prices and some is even said to be disposed of by dumping.

Dried beet pulp, if properly fed, is fully equal in feeding value to maize or barley grain. From at least some factories, it is said to have been exported last year at prices of 4700 to 6000 rials per ton--far less than its value for feed as compared with grain of maize or barley. In at least some locations, a portion of the production is sold to farmers under a permit system for feed, under artificially controlled prices as low as 3000 rials per ton. This policy must be revised to reflect economic reality.

These examples, which are stated as reported to us, may or may not be wholly accurate, but appear sufficient to indicate the need for in-depth study and establishment of factual information. Development of policies to optimize use of the materials should be based on knowledge of the magnitude of the problem.

C. LIVESTOCK PRODUCTION (Vol. 1, p.30)

We now will consider some features of livestock production that result in low productivity of flocks and herds, and alternative solutions of this situation. This large and basic problem was summarized in Volume I.

Livestock Productivity (Vol. 1, p. 31)

The root cause of shortages of animal products in Iran is low productivity of individual animals and individual herds and flocks. In the case of sheep, production of both meat and wool is very low, relative to total inventory. Offtake rate (annual slaughter expressed as a percent of the total national flock) was recently estimated at 22 percent. Carcass production is estimated as 5.0 kg. per head in the national flock. Grease wool production averages only slightly over 0.5 kg. per head in the national flock. Comparable figures for the United States, which is not considered to have a highly efficient sheep industry, in 1972 showed an offtake rate of 78 percent; 13.1 kg. of carcass produced per head in the national flock; and grease wool production of 3.8 kg. per head. Net effect of these differences is that the United States produced about 1.4 times as much meat and 3.9 times as much wool as Iran, from an inventory approximately half as large as Iran's.

Iran's sheep produce about 14.5 kg. of milk per head in the national flock. This partially compensates for the low meat production.

Iranian goats are estimated to have an offtake rate of 26.3 percent and to produce 3.7 kg. of carcass, 18.2 kg. of milk, and 0.5 kg. of hair per animal in the national flock. Thus, productivity is similar to sheep.

Evaluation of cattle productivity for meat and milk in Iran is complicated by their use for work. Offtake rate is only 14 percent, annual carcass production averages only 14 kg. and annual milk production only 188 kg. per animal in the national inventory. Comparable U.S. figures are 33 percent, 87 kg., and 459 kg.

Even if half the cattle in Iran are used exclusively for work (which is almost certainly far too high) Iranian production is very unfavorable.

Approximately 3 percent of Iran's cattle are purebred exotic breeds or crossbreds. These have production levels markedly higher than Iran's national averages but as yet their numbers are too few to significantly influence the overall situation.

Buffalo meat and milk production are about 10 percent of those for cattle. Observation suggests that productivity may be comparable to cattle.

Consequences of Low Productivity

Basic consequences of low productivity are well understood among technically trained animal scientists. However, even these people all too often fail to comprehend their impacts on the national economy. Policy makers often do not develop the sense of urgency the problem truly deserves.

Every animal requires nutrients to maintain essential bodily functions. Nutrients must be consumed for maintenance, regardless of level of productivity. If productivity is zero (i.e., the animal is neither gaining nor losing weight, doing no work, producing no milk and producing no young) 100 percent of the nutrients consumed are used for maintenance. As productivity increases, the percentage of consumed nutrients required for maintenance falls, but it always is substantial.

Of more direct interest is the output of product per unit of feed consumed. In normal ranges of environment and production levels, the feed required per unit of product is nearly always inversely related to the level of production.

These two concepts are illustrated in Annex II in which the total digestible nutrient (TDN) requirements per unit of product and the percentages of TDN consumed required for maintenance are compared for six hypothetical flocks of sheep producing at different levels and managed under different nutritional regimes.

Flock I has assumed production levels generally in line with current Iranian averages. Based on the most probable maintenance requirement (.06W^{0.75}) for Iranian sheep, it requires 75.2 kg. of TDN per kg. of carcass weight produced. Here, 84 percent of TDN consumed is required for maintenance. Flocks V and VI, producing at a relatively high but readily attainable level (approximately three times that of Flock I), require only 34.6 kg. of TDN per kg. of carcass, or less than half as much as Flock I. Even so, 75 percent of TDN consumed still goes for maintenance.

Flock VI would produce about as much meat as flock I with only one third as many animals and with the consumption of only half as much feed.

Similar relationships can be demonstrated for any class of livestock. For example, a 400 kg. cow producing 1000 kg. of 4 percent fat milk in a year requires 1.54 kg. of TDN per kg. of milk. A cow of the same weight producing 5000 kg. requires only .57 kg. of TDN per kg. of milk.

Generally speaking, anything which reduces output of product per kg. of live weight reduces output per unit of feed consumed.

Low productivity due to inadequate feed supplies, imbalanced rations, low genetic potential, death of young, and effects of parasites and diseases all have similar effects--they increase amounts of feed required per unit of product.

The importance to Iran of the points made here cannot be overemphasized. Productivity is so low for sheep, goats, native cattle, and buffalos, that feed required per unit of production is at least twice as high as would be true with normal productivity. Put differently, half or more of the feed now eaten by these classes of livestock is being wasted.

Potential impacts on Iran of increasing productivity of livestock now on inventory in the country can be dramatized by estimating total production of meat and milk if productivity were increased to levels now prevailing in the United States. (In making this comparison we must emphasize that U.S. production is far below that theoretically possible.)

The comparisons in Table 1 show that annual per capita red meat production would be increased from about 10 to 40 kg. and milk from 67 to 115 kg.

Assuming averages of 17 percent protein in red meat and 3.5 percent in milk, the increased production would increase daily per capita supplies of animal protein from about 11 grams to about 29 grams--approximately the levels recommended by FMC (2nd Interim Report, March, 1974) without any allowance for production by poultry.

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Reasons for Low Productivity of Iranian Livestock

Sub-optimal nutrition is the basic cause of low productivity. It can be the result of either too little total feed or deficiencies of specific nutrients for parts or all of the year. Often both occur in the same herds and flocks.

Both are believed to be of major importance with sheep, goats, and native cattle in Iran. Sub-optimal nutrition is beyond all doubt the single most important cause of low livestock productivity in the country.

Until this problem can be solved, improvement in other factors affecting productivity will have only minor effects on production efficiency.

Potential solutions include:

- a. Keep livestock numbers feeding on range, pasture, and crop residues in a continuing numerical relation to nutrient supplies, so that adequate total feed supplies are always available for the numbers grazing. Culling unproductive animals is the best initial approach.
- b. Provide supplemental feeds as required to meet animal needs for both total feed and specific nutrients (such as protein at specific seasons).
- c. Keep specific classes of animals, such as slaughter lambs or dairy cows, in drylots and feed them on harvested feeds.
- d. Make full use of all available feedstuffs, including by-products.

Sociological and economic problems of accomplishing item a, above, are fully recognized. Items b and c depend upon the availability in the country of the necessary feedstuffs and upon a distribution system adequate for getting the feedstuffs to the animals when needed. Item d depends upon proper organization to insure that by-products are not wasted, are not exported at prices less than their true feeding value, and are transported to areas of need. Accomplishment of all four is dependent upon price relationships of feedstuffs and livestock products which will provide economic incentives to producers to feed their livestock to meet nutritional requirements for most efficient production.

Another major cause of inefficient production is genetically inferior animals. This is discussed for each species since situations differ considerably.

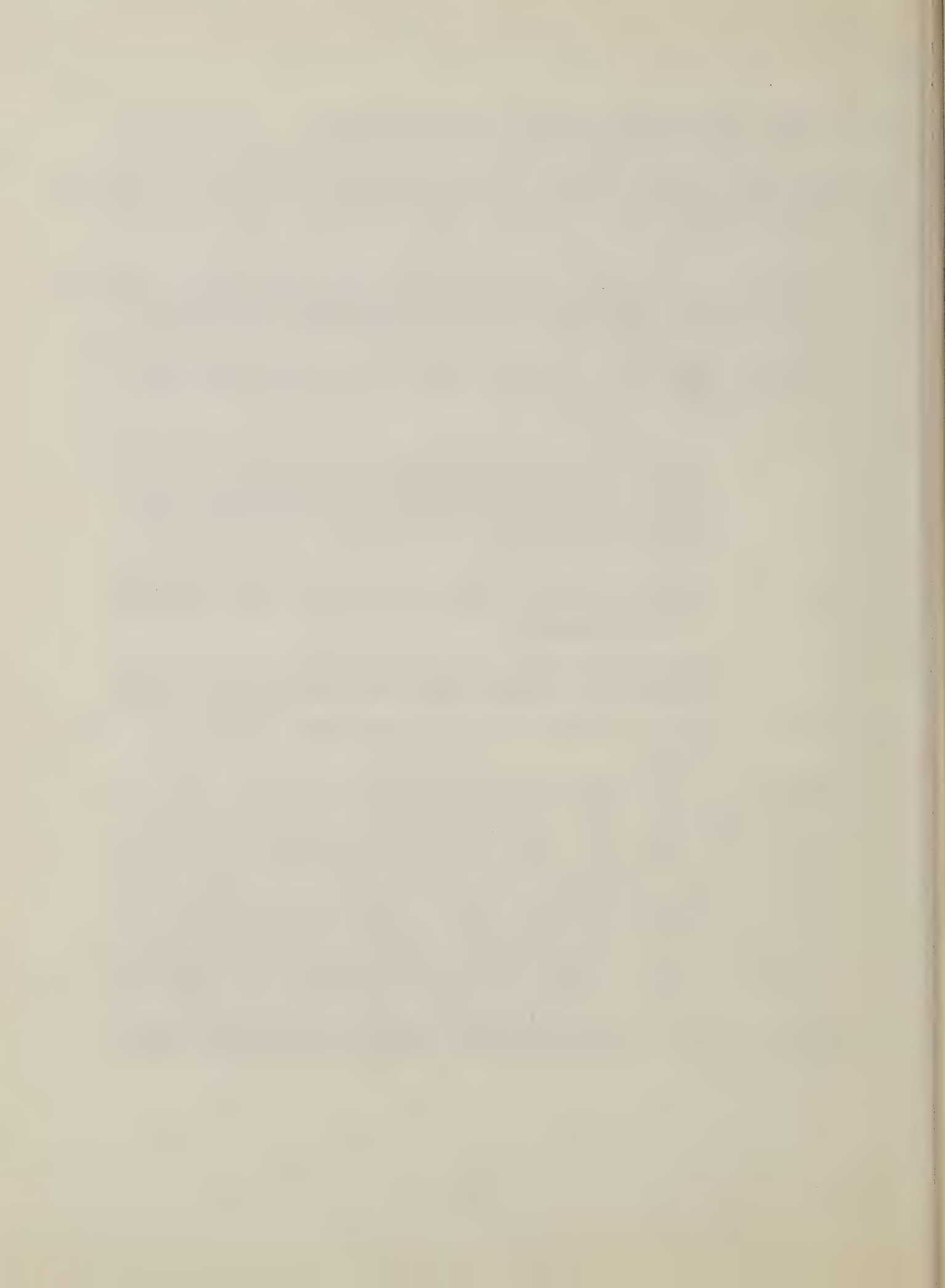


Table 1--Potentials for animal products in Iran if production rates per head equaled those of The United States

Species :	Number on inventory :	Meat			Milk		
		:		Potential at U.S. level	:		Potential at U.S. level
		Current Iran level	Per head		Current Iran level	Per head	
		(Kg)	(Kg)	(M.T.)	(Kg)	(Kg)	(M.T.)
Species :	Number on inventory :	Current Iran level	Per head	Potential at U.S. level	Current Iran level	Per head	Potential at U.S. level
		Total	Total	Total	Total	Total	Total
		(M.T.)	(Kg)	(M.T.)	(M.T.)	(Kg)	(M.T.)
Sheep and goats	44,000,000	5	220,000	13.1	576,000	14.5	638,000
Cattle and buffalo	8,000,000	14	112,000	87	696,000	188	1,504,000
Projections at an estimated Iranian population of 32,000,000:							
Per capita production (annual)		10.5 kg.		39.8 kg		66.9 kg	114.8 kg.
Animal protein per capita (daily)		4.9 grams		18.5 grams		6.4 grams	11.0 grams
Animal protein per capita (daily) from both sources:							
Current production levels				11.3 grams			
Potential at U.S. production levels				29.5 grams			

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Cattle: Native Iranian cattle are generally unsuited to either intensive dairy or intensive beef production. Milk production of native cows is low, even with good feeding and management. Growth rates are too low and the mature sizes are too small for efficient beef production. Growth slows and becomes uneconomic near maturity. Thus, genetic change is essential if Iran is to develop modern beef and dairy industries.

Sheep and Goats: Native breeds and types developed over periods of many centuries under the harsh nutritional and environmental conditions of Iran are apparently well suited to survive and produce at low levels under such conditions, even though overall production per unit of feed consumed is low.

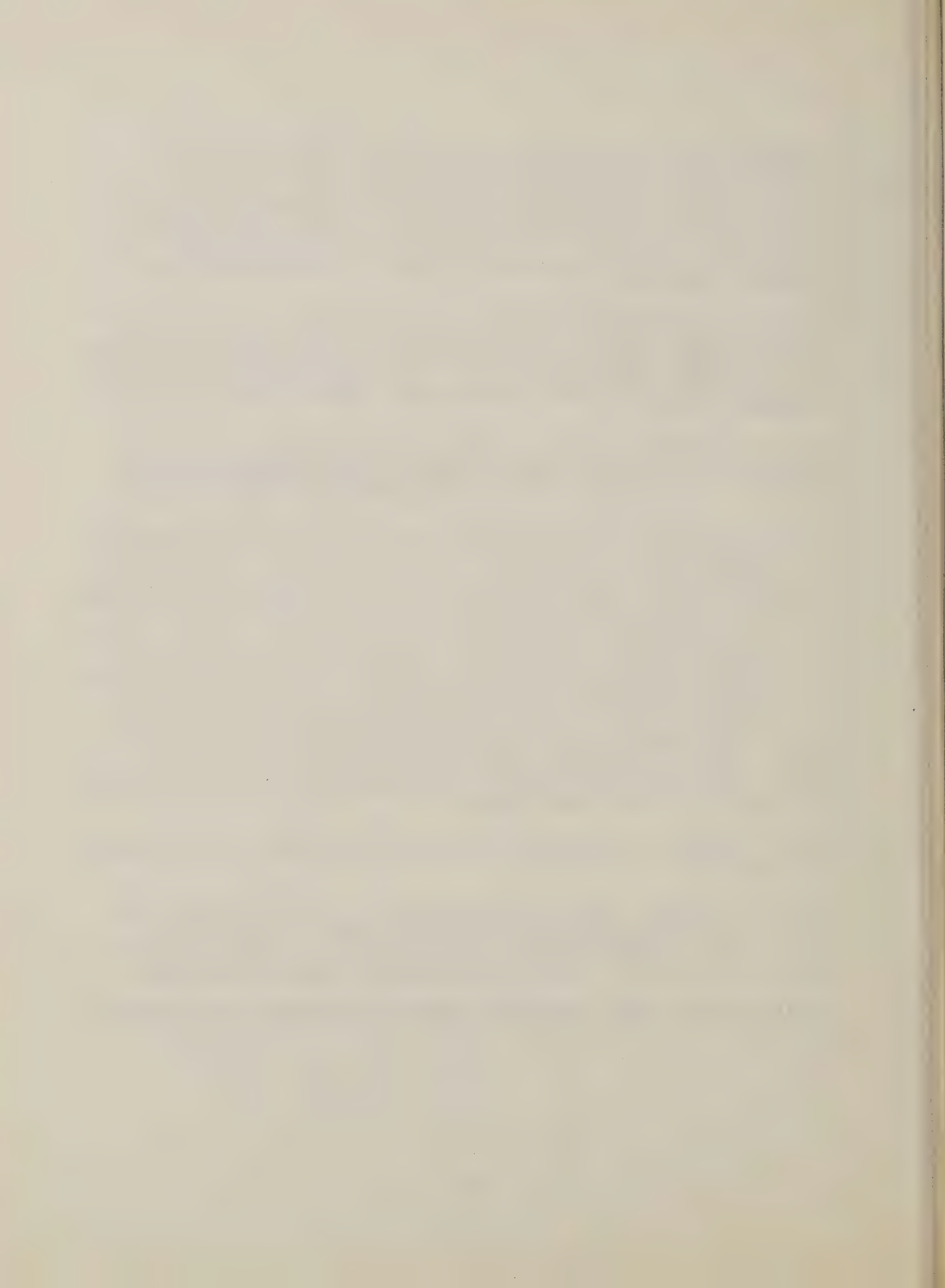
However, relatively little is known as to whether other types would produce more efficiently under management regimes providing adequate nutrition and reduction of the more important environmental stresses.

Three characteristics of most native breeds raise questions regarding their adaptability to improved situations. First, the twinning rate is low, seldom exceeding 30 percent even under good nutritional conditions. Second, most breeds have a large fat tail which, depending on the degree of fatness of the animals, may equal up to 15 percent or even more of total carcass weight. Fat of the tail varies in price with the season but usually sells for only about 40 to 50 percent as much per kg. as the remainder of the carcass. With continued trends toward demands for less fat in human diets, this price disparity may well become greater in the future. Thus, it is essential to determine whether lean meat of desirable flavor can be produced more efficiently by non-fat-tailed types. Third, many native breeds are small in size and carcasses become excessively fat if animals are fed and raised to heavier weights in efforts to increase meat supplies.

A third cause of low productivity is the loss of weight due to stresses of migrations.

Studies a number of years ago indicated that Iranian livestock lost weight during migrations equivalent to more than the total weight of all sheep and goats slaughtered annually in the country. There is no evidence that this situation has materially changed since then.

In addition to weight losses, the stresses of migration are undoubtedly a factor in high death rates.



The high ranges, suitable for livestock only during the summer months, represent a source of feed which should be utilized in the overall livestock industry of Iran. However, the problem of how to accomplish this without excess stress and losses of both weight and animals has not been completely solved.

A fourth factor in inefficient production is deficiencies in management.

Basically, good livestock management requires a series of decisions providing: (1) optimum nutrition; (2) optimum genetic types for particular climates, feed supplies, and market demands; (3) alleviation of environmental stresses; and (4) control of diseases and parasites.

Overall, Iranian livestock producers fall far short of attaining optimum management procedures. Improvement will depend upon education and, in many cases, upon the development of better knowledge through research. However, many dairy and poultry producers now have excellent management programs, as indicated by high levels of production and minimal death losses.

A fifth major cause of inefficient production is high death rates and effects of ill health on animal growth and production. It is estimated that in Iran the lamb mortality rates average about 15 percent, that 10 percent of yearlings may die, and that annual mortality of older sheep may average 5 to 8 percent. Average annual death rates for cattle have been estimated to be as high as 8 percent, with losses of young calves averaging well above this figure. Regardless of the exact accuracy of these estimates, it is generally recognized that death losses are far too high for efficient production.

Ill health not resulting in death as a factor reducing efficiency of production is less spectacular and not as easily quantified as deaths. However, it may be fully as important in reducing production efficiency. Few estimates of its extent are available. Causes of death and ill health are many, with interactions and multiplicative effects of several factors likely being important. Causes include:

- a. Starvation or semi-starvation
- b. Stresses of migration
- c. Stresses of climate
- d. Poor sanitation practices in and around animal quarters
- e. Diseases, particularly those such as pneumonia, influenza, and other respiratory types which flourish in undernourished animals under environmental stresses in unsanitary surroundings

f. Parasites

It should be stressed that effects of the above have not been well quantified. Determinations of the effects and importance of the different factors should be made. This is especially important in the case of parasites. Most veterinarians and animal husbandrymen believe these are important but little hard data are known to exist.

Diseases of the epidemic types, such as foot and mouth disease, rinderpest, and others have caused serious losses in Iran in past years but are apparently now reasonably well controlled by the Ministry's vaccination programs.

Justification for an Immediate Action Program

Ability to launch and complete a program, based on one or a combination of the alternatives presented in Volume I, is clearly within the capability of Iran provided this action has the highest priority and sufficient commitment at all levels of government. A nation which has demonstrated its ability to increase numbers of students in elementary and high schools 14 times in less than 25 years, to develop facilities permitting increasing college and university enrollment nearly 20 times in the same period, to industrialize at an unprecedented rate, to successfully house and feed over 100,000 refugees from a neighboring nation on short notice, and to make rapid progress in many other areas, cannot afford to allow itself to be defeated in modernization of its livestock industry.

It is unfortunate that each of the alternatives presented involves a reduction in livestock numbers. This may seem paradoxical in view of the increasing demands for animal products. However, excessive numbers result in each animal receiving less than the amount of feed required for full production. Thus, higher than normal percentages of the feed eaten are used for maintenance. There is every reason to believe (see Annex II) that much less total feed than now consumed would be required by smaller numbers of animals to produce as much meat as Iran now produces.

One hypothesis is that feed from cropland could make up the deficits, and the present numbers of animals could be maintained. It is true that increased production of animal feeds, particularly forages, on cropland is a long time goal for increasing Iran's livestock production. However, it would require half to two thirds of Iran's cropland in addition to range grazing to produce the feed needed to bring nutrition of present livestock numbers up to an adequate level.

In Iran, cropland available to grow forage is that remaining after the need for cereals, primarily for human consumption, has been met. So long as the highest priority on cropland is for cereals, there is no

way, at current levels of production, to devote two-thirds, or even half the nation's cropland to the production of livestock feed. The only solution is to reduce numbers of livestock. To effect some reasonable degree of relief to the overburdened and deteriorating grazing lands, a reduction of 50 percent is proposed in two of the alternatives. The reduction of animal numbers under Alternative 1 will depend on individual total feed resources but may well average 50 percent or more. Reductions of this magnitude may at first appear radical, but when considered in relation to the critical condition of the grazing lands, they are reasonable and workable. In conjunction with measures discussed in other parts of this report, they constitute a practical and very rapid solution. More orthodox measures, which might have been effective 20 years ago, may not now be fast enough to cope with the present critical situation.

Alternative 1 provides a comprehensive program over and above reduction in numbers to accomplish other changes needed for maximizing productivity of livestock.

Alternatives 2 and 3 emphasize reduction in numbers. However, they should be accompanied by supplementary programs to further other objectives.

The recommendations under all three alternatives are fully compatible with and will stimulate amalgamation of livestock enterprises into units of optimum size for most economical production. Alternative 1 especially, but also Alternatives 2 and 3, will provide base populations of animals more suitable than now available in the country for whatever production systems eventually prove to be superior for Iran or for specific parts of the country. This will be true regardless of whether these are farm corporations, production cooperatives, agri-businesses, or independently-owned farms of family size. The cattle programs would be an excellent prelude to the development of cow centers at which milking cows of several villages are placed for efficient handling.

Proposed Action--Alternative 1. The recommendation is to establish a new national unit or organization to work through Animal Production Field Men at the village and tribal levels with sheep, goat, cattle, and buffalo producers. If Agricultural Extension can be given a new and higher status with capability for handling the new program, it should be made a unit of Extension. If the Extension proposal is not activated promptly, the new organization to accomplish this job should be given independent status.

High school graduates from rural backgrounds should be recruited for the program. Preference should be given graduates of agricultural high schools and to persons with some experience after finishing school or to persons with one or more years of college.

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Salary levels, including payments during the training period, should be sufficient to attract capable people and should be flexible enough to hold the most successful and effective persons in the jobs. Consideration should be given to integrating this effort with the present Development Corps program provided Corpsmen could be diverted from the standard training program and if they would make a binding commitment to continue work at a pre-determined salary for a minimum of two years following completion of the period of compulsory service.

The program recommended is massive and when fully implemented could include as many as 10,000 Animal Production Field Men and 1,000 veterinarians.

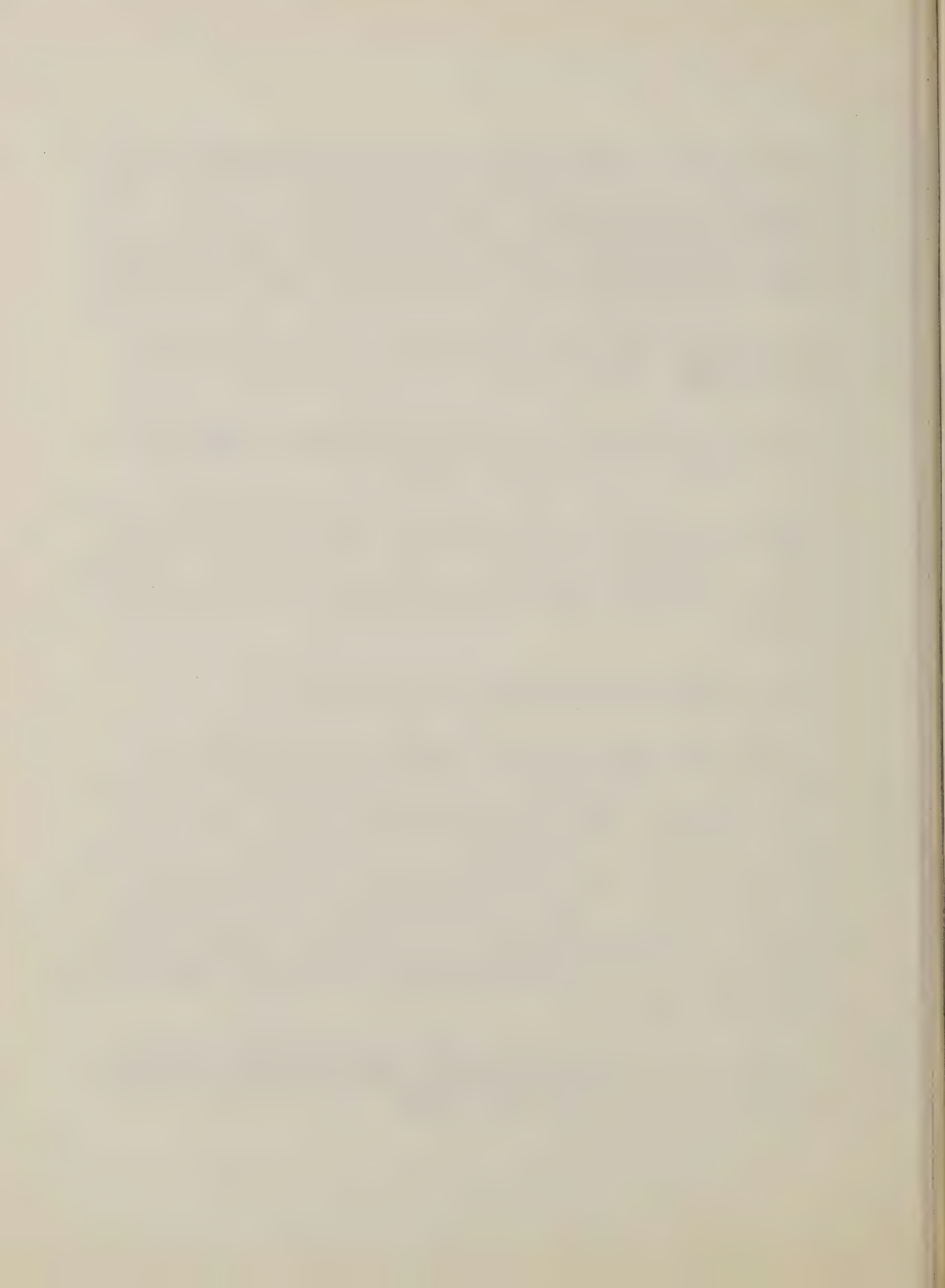
A training center for Animal Production Field Men and supervisors is required. It should be in an area where livestock are important to permit training involving actual field work.

Initially, the training center can be established on an interim basis in under-utilized facilities of an existing organization if they can be found. If not, instruction can be successfully undertaken in camps or in quickly constructed temporary buildings. The success of the United States in using such facilities to train thousands of young men in the Civilian Conservation Corps in the 1930's serves as an example of the potential.

Recruits should be given six month's intensive training in animal production and the evaluation of ranges and pastures.

At completion of the training period, they should be placed in villages or with tribal groups with broad authority to establish quotas for ownership of livestock and to issue permits in accord with the quotas. Quotas should be established on the basis of estimates of numbers which can be adequately nourished on available grazing lands, crop residues, and harvested feed. Arrangements will be made to acquire supplemental feeds necessary for balanced rations for each class of livestock. Kinds of livestock enterprises to be followed will be important factors in determining quotas. Owners will be encouraged to cooperate in establishing feedlots for fattening both lambs and calves in areas where adequate amounts of feeds such as barley, maize, alfalfa hay, and maize silage can be produced and where price relationships are such that fattening can be profitable. This will reduce grazing pressures on ranges and pastures and thus permit higher quotas.

The new organization will have to develop the necessary infrastructure, in cooperation with existing organizations such as the Pasture Development Fund and others, to acquire and distribute the required supplemental feeds and to provide credit where needed.



A second major activity will be supervision of breeding programs through provision of approved sires (or semen of approved sires) and the enforcement of rules that only these sires be allowed to impregnate females.

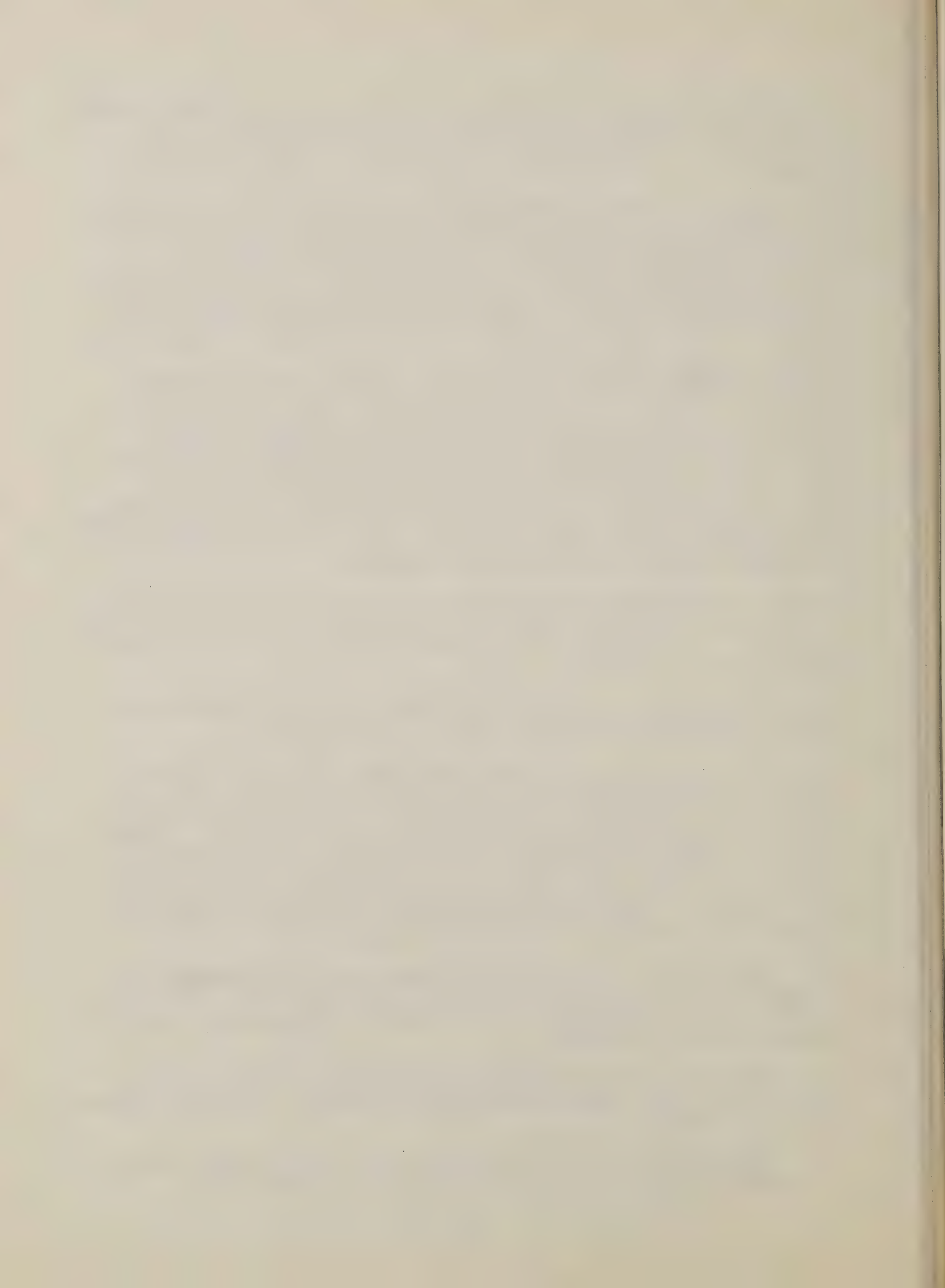
In the case of cattle, a determination will be made for each herd as to whether it will be up-graded to an exotic breed with high inherent growth rates and milk production or maintained as a native type. It is anticipated that only a few areas will retain native types, primarily where there are native types of better than average production characteristics worthy of preservation and improvement, such as the Sarabi, or where disease problems preclude use of exotic breeds.

Exotic bulls required will be purchased from dairymen now fattening them for slaughter in Iran. In the case of sheep and goats, determinations of breeds to be used will be made. When native breeds are chosen in the case of either cattle or sheep and goats, males for breeding will be selected, to the fullest extent possible, from herds and flocks in which systematic selection programs for improvement are being carried on. If sufficient numbers are not available from such herds and flocks, selections will be made from local groups thought to represent the best available of the breed or type. The system designed for their use should avoid inbreeding.

Other activities will be centered on aiding producers in marketing and in management procedures especially as related to disease and parasite control. Full cooperation of the Meat Organization and the Veterinary Organization is required.

More specifically, activities of the Animal Production Field Men, and the infrastructure supporting them, will be as follows:

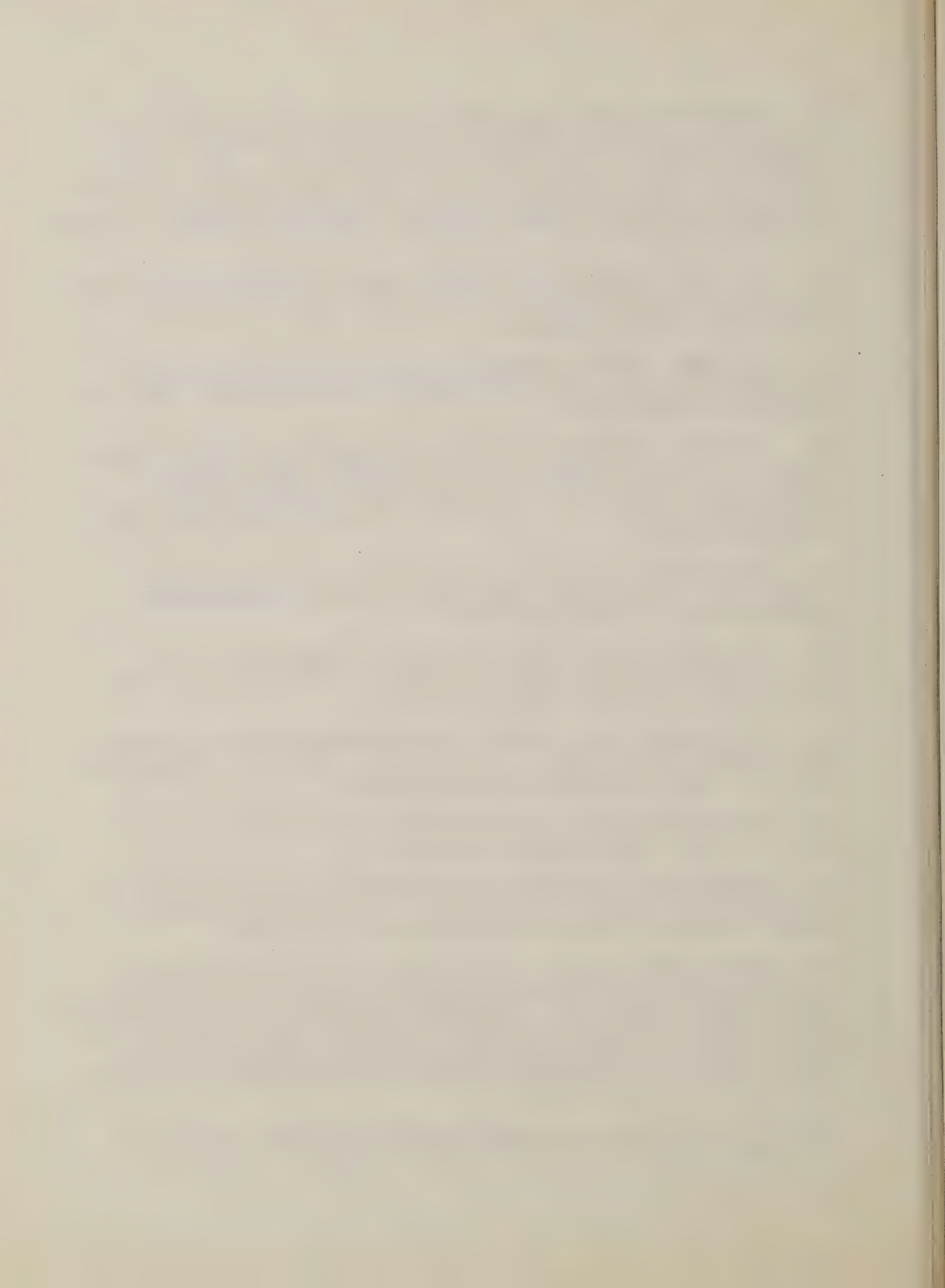
1. Establish quotas for breeding age females (one year of age and older for sheep and goats, two years of age and older for cattle and buffalos) of each species for each owner in village or tribal herds or flocks and issue permits for ownership up to the quota level. Quotas are to be based on estimates of the numbers which can be adequately fed. As a general guide, numbers should be reduced approximately 50 percent but with modifications which on-the-site observations indicate are realistic. Quotas should be reviewed periodically and changed as experience indicates desirable for specific areas.
2. Supervise the initial culling of herds and flocks necessary to reduce numbers of breeding age females to the quota level. Cull the old, infertile, and unproductive animals. Generally, goat numbers should be reduced relative to sheep.
3. Maintain a continual program of supervising the culling of herds and flocks. Young animals produced may be fattened and sold for slaughter or sold as feeders.
4. Supervise the sale of culled animals and sale of young animals on a systematic basis to the Meat Organization or to feeders.



5. Determine the kinds and amounts of protein, mineral, and vitamin supplements required to provide balanced rations for planned type of production for each herd and flock at the quota level. Acquire these feeds on the open market and resell to animal owners at cost, providing credit where necessary. Cancel permits for ownership of animals of any owner unwilling to purchase necessary supplemental feed and reallocate to other owners.
6. For cattle, determine for each herd whether it should be maintained as a native type or up-graded to exotic breeds with high inherent growth rates and milk production.
7. For cattle, enforce a program of castration or sale to feedlots for eventual slaughter of all bull calves eight months old or older not approved for breeding use.
8. For cattle, provide approved bulls or semen for artificial insemination of the breed selected for use in a specific area to a herd (or groups of herds as possible taking herd sizes and distances into account) and breed cows on a fee basis calculated to cover costs over a period of years.
9. For sheep and goats, on the basis of observation and available research data, determine for each flock the breed or crossbreeding program likely to be most profitable.
10. For sheep and goats, enforce a program of segregation of males older than six months and sale for slaughter by a maximum of one year of all males not approved for breeding use.
11. For sheep and goats, provide approved breeding males as required for impregnating the females of each flock on a fee basis. Alternatively, artificial insemination service can be provided.
12. For migratory flocks, organize programs for transport by truck or the provision of supplementary feed enroute.
13. Maintain close liaison with field representatives of the Veterinary Organization and establish sanitation and other disease and parasite control procedures to be followed by herd and flock owners.

The Veterinary Organization should increase its staffing level in the areas covered by this program to at least one veterinarian for each 10 Animal Production Field Men. The veterinarians would advise on sanitation and management procedures for disease and parasite control and carry on intensified vaccination programs and eradication programs for disease and parasites that constitute public health hazards such as tuberculosis, brucellosis, and cystosarcosis.

14. A training program for Animal Production Field Men should be the first phase of the program and should be maintained on a continuing



basis. The program suggested should begin on a relatively small scale initially embracing perhaps 1,000 villages in a contiguous area in an Ostan considered to have the best potentials for livestock production. As experience is gained and as rapidly as Field Men can be trained, the program should be extended to other villages. With aggressive approaches it should be possible to cover the nation in six to eight years.

To handle both cattle and sheep and goat programs, a Field Man for each four to eight villages would likely be needed with initial experience in this regard to guide future assignments.

Implementation of Alternative 1

1. Determine if legislation is needed to carry out the plan. If so, draft legislation in one month and secure enactment in six months.
2. While legislation is in progress, or immediately if legislation is not needed, develop staffing plan for new organization and plans for first training center for Animal Production Field Men. It is assumed that the first training center can function on an interim basis in currently under-utilized facilities or in temporary facilities of a camp or camplike nature. Begin recruitment of first group of 150 trainees. Trainees should be high school graduates from rural backgrounds.
3. Within one month of enactment of legislation, or sooner if legislation is not needed, activate the new organization with at least 12 instructors for first Animal Production Field Man Training Center. Enroll first group of 150 trainees. Recruit 10 B.S. level persons as potential supervisors and train them at the same time as the Animal Production Field Men.
4. After a six-month training period, station first class of trainees in villages as Animal Production Field Men with a supervisor for each 15 to 20.
5. Double the size of both the training and action programs each year until the nation is blanketed with Animal Production Field Men in six to eight years. Thereafter, train at levels necessary to maintain numbers.

Proposed Action--Alternatives 2 and 3

These alternatives call for reductions of 50 percent over a period of not more than five years in numbers of females of breeding age (one year of age and older for sheep and goats, two years of age and older for cattle and buffalo) in all herds and flocks which graze for all or part of the year on National Rangelands, village grazing lands, or other land not in private ownership. The reductions would be carried out by administrative action and would be partially self-policing.



Thus, numbers of new or additional personnel for administration would be much less than for Alternative 1. It is expected that present Extension Service and Extension and Development Corps personnel acting through village and tribal leaders would be the key people in the programs.

The 50 percent reduction is arbitrary but is believed to be no larger than is required on a national basis. The programs should include provision for appeals by individual owners and adjustment of reductions in cases where feed supplies are clearly ample for more than 50 percent of original female numbers. Similarly, there should be provision for additional reductions after five years in cases where 50 percent of the original number is still clearly too great to permit recovery of grazing land. Committees of village and tribal units should be appointed to work with Extension Service personnel in adjudicating appeals and imposing reductions in excess of 50 percent.

Action under either of these alternatives should be accompanied by stepped-up Extension educational activities, and preferably by demonstration flocks and herds, to show people that it is in their own interests to reduce numbers. Meat production by offspring of the remaining 50 percent of breeding females should be fully as great as at present due to high reproductive rates and more rapid gains by animals with better feed supplies.

It may be helpful to give estimates of expected production and income under a program of reducing numbers of breeding females 10 percent per year over a five year period.

In Annex II, hypothetical Flock I is producing at a level somewhat equivalent to current Iranian levels while Flock IV is producing at a level believed to be attainable in Iran by at least most breeds under programs of adequate nutrition, management, and disease and parasite control. The following tabulation gives vital statistics and expected production for flocks of 100 ewes one year old and older in each of the two flocks.

	<u>Producing at level of Flock I</u>	<u>Producing at level of Flock IV</u>
No. ewes one year old and older	100	100
No. animals, total Jan. 1 inventory	132	107
Avg. live wt. at slaughter (kg)	35	40
Annual sales for slaughter: No. animals	39	71
Total live wt. (kg)	1,379	2,827
Offtake rate:		
Per ewe one year old and older	.39	.71
Per animal in Jan. 1 inventory	.30	.66

It is assumed that ewe numbers are reduced at the rate of 10 percent per year, that sale prices are 60 rials per kg., and that indemnity payments equal to one half the value of a slaughter lamb are paid for each ewe reduced in all prior years.

Numbers marketed and income will then be as shown in the top portion of Table 2 if there is no improvement in either reproductive rate or weight at sale. Income of the flock owner would be more than maintained and grazing pressures would be greatly reduced on ranges, thus accomplishing one major objective of the reduction. Meat production would, of course, be greatly reduced and indemnity payments would have to be continued indefinitely to maintain income.

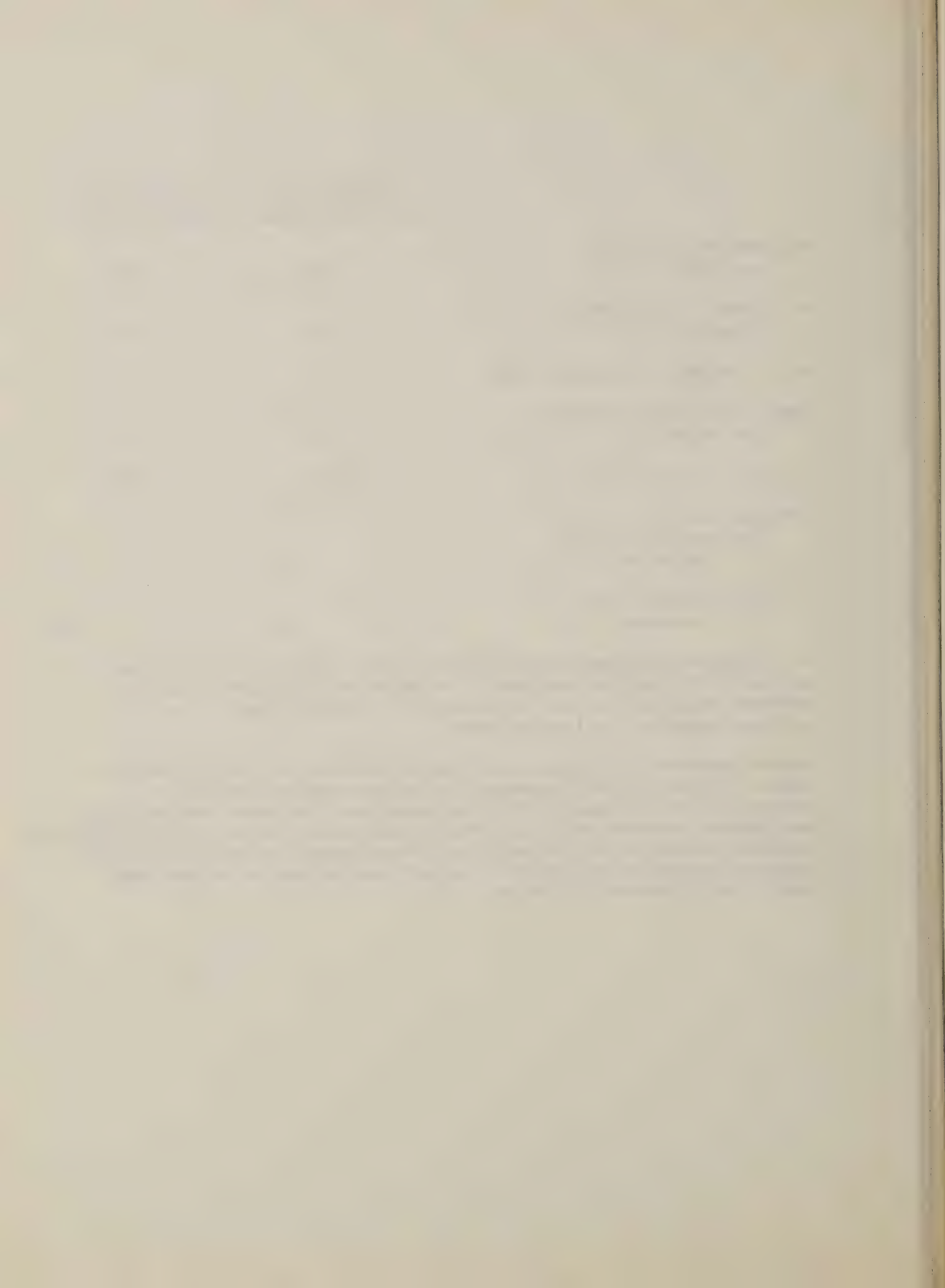


Table 2--Estimates of income from flock of 100 ewes under a program of 10 percent reduction in breeding ewes per year for five years. 1/

Year:	Sales				Indemnity	Total income Rials
	No.	Rials	No.	Rials		

1. Assuming no increase in reproductive rate or weight at slaughter:

1	39	88,725	10	22,750	--	111,475
2	35	79,625	10	22,750	11,375	113,750
3	31	70,625	10	22,750	22,750	116,025
4	27	61,425	10	22,750	34,125	118,300
5	23	52,325	10	22,750	45,500	120,575
6	20	45,500	--	--	56,875	102,375
7	20	45,500	--	--	56,875	102,375

2. Assuming increase over 5-year period to reproductive rate and weight at slaughter of Flock IV:

1	39	88,725	10	22,750	--	111,475
2	35	79,625	10	23,400	11,375	114,400
3	36	86,580	10	24,050	23,400	134,030
4	36	88,920	10	24,700	36,075	149,695
5	35	88,725	10	25,350	49,400	163,475
6	32	83,200	--	--	63,375	146,575
7	36	93,600	--	--	63,375	156,975

1/ Flock is assumed to be initially at production level of Flock I (see Annex II).

THE HISTORY OF THE CITY OF BOSTON

FROM THE FIRST SETTLEMENT TO THE PRESENT TIME

BY SAMUEL JOHNSON

IN TWO VOLUMES. VOL. I.

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THE HISTORY OF THE CITY OF BOSTON

In the bottom portion of Table 2 the same type of calculation is shown based on the assumptions that reproductive and growth rates will increase gradually to levels of Flock IV over a period of five years beginning in the second year for weight and in the third year for reproduction. We believe these assumptions are reasonable and can be attained.

If the increases in production are attained, income from production would exceed initial levels. Indemnity payments could be reduced or eliminated after six years without reducing income levels of the producer.

Under both production level assumptions in Table 2, producers would increase income considerably in the early years as a result of sales of excess animals and indemnity payments. Following Alternative 3 and forcing them to use all or part of the extra money for feed would increase the probability of attaining the higher production level. We emphasize that the size of indemnity payment shown here is purely hypothetical and should be established when the program is initiated at a level believed necessary for attaining desired goals, both physical and social.

Alternative 3 would require more supervisory and administrative effort than Alternative 2 but the requirement of a harvested feed supply to supplement grazing would go far to stabilize production per breeding female at high levels.

Programs under these alternatives are not as inclusive as Alternative 1. Therefore, they should be accompanied by intensified educational programs and other programs such as artificial insemination and vaccination over and above those necessary for bringing animal numbers into line with feed supplies.

Implementation of Alternatives 2 and 3

If either Alternative 2 or Alternative 3 is selected as the basis for action, a small headquarters organization should be developed within one month. The first activity of this group, working through supplementary task forces as necessary, would be to determine the most rapid, yet feasible, schedule for buying breeding animals from herds and flocks, slaughtering them, and disposing of carcasses in an orderly manner. This must be done while carrying on normal slaughter operations and without interfering with the normal flow. Factors to be considered include:

1. Capability of slaughter houses for handling additional animals. Additional shifts may be necessary.

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2. Market outlets for additional meat and by-products. The Iranian market, frozen storage capacity, possibilities of exports, and effects on planned meat imports should all be considered.
3. Capability of existing buying, transport, and marketing structure for live animals to acquire and transport additional animals to slaughter houses. Arrange for the Meat Organization to recruit and train additional buyers as needed and to arrange for additional transport.

While these efforts are underway, plans should be developed in cooperation with the Extension Service to carry on a publicity campaign to inform livestock owners of the program. As soon as procedures can be considered firm, every available means of communication should be used to inform producers about:

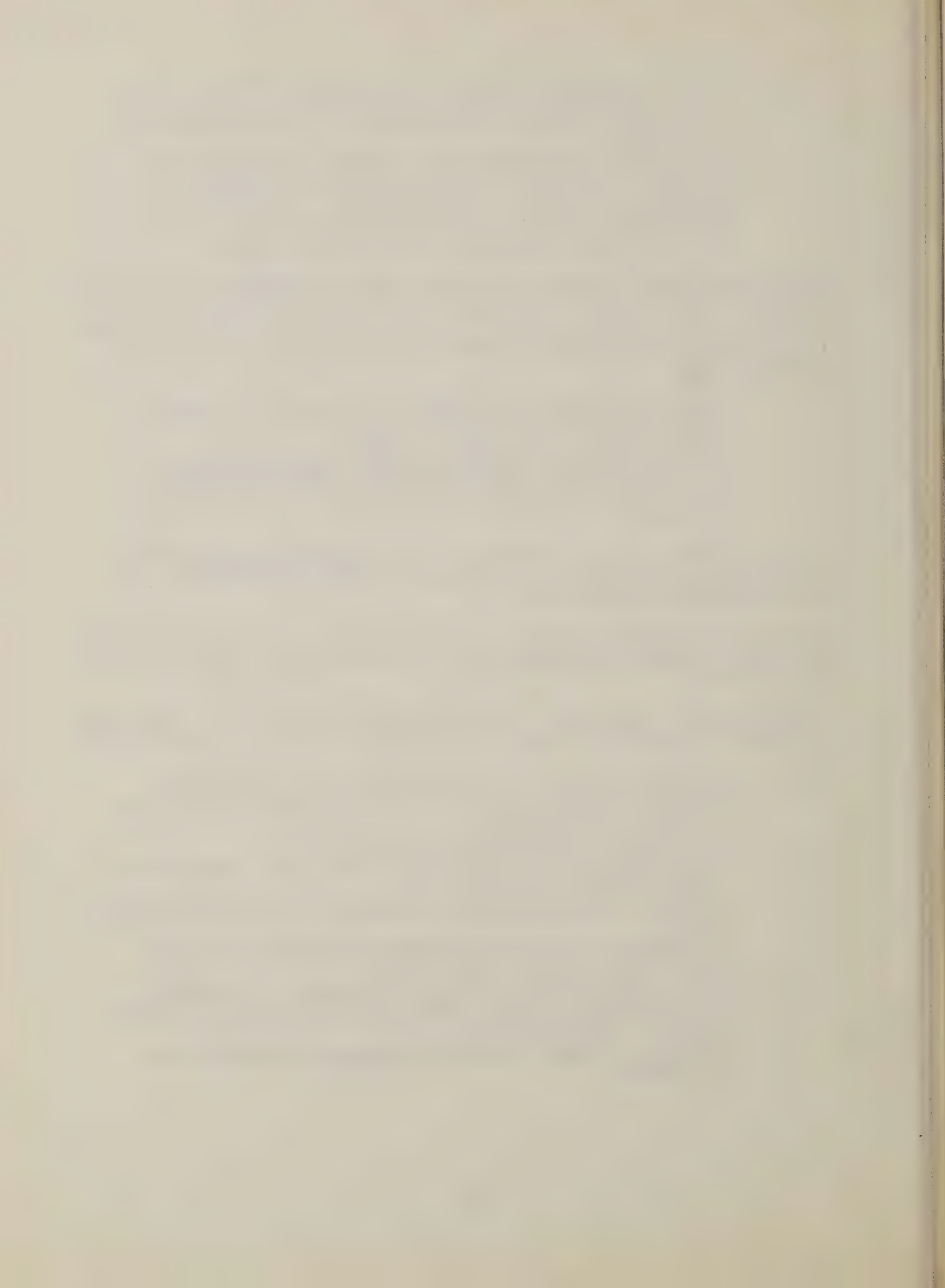
1. Schedule for reductions to meet the projected 50 percent.
2. Prices to be paid for animals culled.
3. Procedures to be followed in selling excess animals.
4. Action necessary to qualify for the incentive payments. This will differ depending upon whether Alternative 2 or Alternative 3 is chosen.

Within six months of establishment of the headquarters staff, buying programs should be initiated. The program should then cover the nation as rapidly as possible.

A control program will have to be established through village and tribal head men to insure that numbers are as reported and that reductions are actually made.

Highly desirable supplementary activities to be stepped up or inaugurated by appropriate existing agencies in connection with this program include:

1. Develop a transport system to reduce migration stresses.
2. Provide advisory services to livestock owners on nutrition, management, and breeding.
3. Provide artificial insemination service.
4. Make exotic bulls available to villagers on a low-cost basis.
5. Expand veterinary services.
6. Encourage forage production through price fixing at incentive levels.
7. Increase availability of supplementary feeds, including use of subsidies where appropriate.
8. Make irrigated land available to tribesmen to encourage settlement and to permit them to grow their own supplemental feeds for migratory flocks.
9. Encourage villages to establish cooperative feedlots and cow centers.



Relationship of Recommendations to Proposals Made by Others and to Current Programs

Dr. M. L. Upchurch in his 1972 report to MANR on improving livestock production in Iran recommended that the Ministry.... "Establish a national sheep and goat culling program." The recommendations here implement Dr. Upchurch's proposal and extend it to cattle and buffalo. Dr. Upchurch also recognized the need for healthy animals and for improvement in genetic capacity if production is to be efficient. The present recommendations, particularly Alternative 1, provide for both.

Preston (1972) ^{1/} recommended immediate development of feedlots for both cattle and sheep as a short-term measure. By feeding to raise carcass weights to optimum levels, meat supplies for the nation would be increased. At the same time grazing pressures on ranges would be reduced. Feed grains should be imported as necessary. Internally, emphasis should be given to full use of by-product feeds, and to developing a program of maize growing to eventually produce needed feed stuffs. He presented calculations indicating that intensive sheep production systems could not be profitable at present fertility levels. For long-term solutions, he recommended a National Sheep and Cattle Genetic Improvement Plan to increase reproductive rate, improve growth rate and feed efficiency, and reduce the fat tail in sheep. In cattle, emphasis would be on improving efficiency. In these programs, he envisioned both crossbreeding with exotic breeds and the improvement of indigeneous breeds. A massive crossbreeding program to the Holstein and Brown Swiss breeds was suggested for cattle.

All alternatives of the present recommendation are completely compatible with Preston's analysis of needs. They provide methods to accomplish most of his recommendations.

McDowell (1972) ^{1/} concluded that the 1971-78 program of the Animal Husbandry Organization emphasizing expansion in the number of livestock substations, artificial insemination units, and government-owned herds to produce bulls for artificial insemination centers was unlikely to significantly stimulate production and would impose a serious drain on limited manpower resources. He recommended higher priorities be given to the development of technology on feeding systems, herd management in relation to animal health problems, animal housing, and improved reproductive efficiency. He emphasized the need to improve training of animal scientists and veterinarians in the universities to better enable graduates to deal with practical field problems. Shortages of competent managerial talent was cited as a major cause of low performance in many animal production enterprises. To meet research needs he recommended establishing animal science research as an independent unit reporting directly to the Under Secretary for Research and Special Projects.

^{1/} See bibliography.

Several of McDowell's recommendations relate to other sections of this report. All alternatives of the present recommendation agree with his emphasis on the need for improvements in feeding, management, and animal health as prerequisites to improved production efficiency.

A 1972 report by FAO experts (Anon. FAO, 1972) 1/ included the following statement: "The fundamental factor preventing the increase of livestock production in the country, is the lack of sufficient feed for the animals. This is an end result of excessive numbers of low producing animals relying on no-cost range grazing with consequent destruction of range and lack of incentive either to market surplus and old animals or to intensify production."

The present proposals are designed specifically to deal with this problem. Animal numbers would be reduced to those which available feed supplies will support at normal production levels. More animal products will be available for consumption and destruction of ranges and pastures can be controlled.

Only a part of the plans of MANR and the Iranian Government (example, revised 5th Plan) have been available to this Team. Thus, it is impossible to determine the extent to which recommendations in this section of the report either duplicate or may be in conflict.

A recent report by the International Bank for Reconstruction and Development (Anon. IBRD, 1974) stresses the fact that current plans of the Ministry concentrate heavily on the fattening, slaughtering, and marketing of sheep and goats, particularly through large-scale agri-business and meat complexes, as a means of increasing red meat production. The IBRD report pointed out that this approach was unlikely to add more than 30-40,000 tons to total meat supply. This report recommended intensive efforts to increase off-takes from breeding flocks to meet goals for meat production and to provide animals for fattening operations. Necessity for additional feed production was stressed.

The same report strongly recommended a crossbreeding program with cattle as a low-cost, more practical approach to increasing dairy production.

Thus, the current recommendations, especially Alternative 1, are in full agreement with IBRD's assessment of needs.

1/ See bibliography.

The plan announced in 1973, to import 200,000 exotic dairy cows over a five-year period, represents a different approach to animal improvement than the massive crossbreeding and grading-up program of Alternative 1 of the present proposal. Both have the same objective. We believe the importation program should be continued but recognize that shortages of suitable animals in other countries, problems of transport, shortages of trained managerial personnel capable of handling purebred exotic cattle, as well as other factors, may reduce numbers of imported animals below the goal. Presumably, the fact that only a few thousand have been imported thus far reflects the problems enumerated.

So far as we are aware, it was never intended that an importation program would fill all of Iran's needs for high-producing dairy cattle.

The analysis in Annex III indicates that grading-up has several advantages over an importation program. Particularly at present price levels, it is unlikely that income will be sufficiently greater from herds based on imported cows to return acceptable rates on the additional capital required as compared to that needed for starting dairies with F_1 cows if they were readily available in village herds. The current recommendation (all alternatives, but especially Alternative 1) provides a mechanism to produce F_1 heifers in large numbers. The additional beef production potential of the F_1 bull calves produced concurrently would also be of great value to the nation.

Thus, there appears to be a real need for the massive crossbreeding and up-grading program recommended for cattle.

D. MARKETING (Vol. 1, p. 36)

The primary function of the livestock, meat, and feed marketing system of Iran should be to supply to the consumer the desired products at the time, place, and in the amounts which consumers want and are able to buy. To accomplish this requires that the pricing system transmit, concisely and accurately, consumer desires through the system from retail markets to production units.

The key to successful adjustments by producers is the rapid and accurate formulation of product prices at different levels of the marketing system. Rapid and accurate price formulation requires homogeneity of products, uniformity of terminology, and objective methods of product appraisal throughout the system.

Classification and Grading Standards (Vol. 1, pp. 37, 39)

Critical to these improvements is the use of a functional classification (use) and grading (quality) system based on standards accurately reflecting consumer desires.

Establishment of a Livestock and Meat Standards Branch in the Iran Meat Organization (I.M.O.) is the logical first step to fill this critical void. As the only official agency and as the major commercial force in the Iranian meat industry, I.M.O. is the logical location for this branch. To accomplish this and to prevent conflict of interests between the commercial section of I.M.O. and the grading and other service and regulatory branches, the scope, authority, and responsibility of I.M.O. should be broadened and increased with separate sections being virtually autonomous in their area of responsibility.

The standards should be developed specifically for Iran but could be useful and perhaps directly applicable to foreign meat imports. Any potential use in the import program, however, should not affect the standards so they would not perform their primary function of directing the domestic production of livestock and meat.

In the present market system, age, muscling, fat condition, and other factors affecting tenderness, flavor, and other eating qualities of meat appear to have little influence on the price. As a result, consumer desires are thwarted and the market forces are incapable of pushing for a higher quality product.

Some informal, unofficial grading appears to take place at the butcher level; an extra payment will purchase more desirable cuts from higher quality animals. Grades could provide a legal means of price discrimination and at the same time aid in the regulation of product flow. Through realistic price differentials for different quality grades, more efficient use of production resources could be encouraged and they should provide incentives to improve quality and increase total production.

The increasingly affluent Iranian consumer is able to pay for higher quality beef and mutton; quality meats from these species are available in the foreign market. Unless proper circumstances, including live animal and carcass use classification and quality grades, are provided to encourage larger and higher quality meat production, imports will continue to increase and domestic production will fall far short of the planned goals.

Feeder Livestock (Vol. 1, p. 41)

Development of large, modern, commercial cattle and sheep feeding operations would significantly increase total Iran meat production and, at the same time, improve quality from the same or an even

smaller livestock population. Other benefits would include reduced pressure on grazing lands and village and migrant flock forage supplies.

However, before the commercial feeding program can deliver these benefits, a system to procure large numbers of animals with feeding potential needed by the feedlots must be developed. The assumption that the tribal and village flocks will market thin, lightweight animals that have feeding potential only to feedlots rather than to traditional slaughter buyers does not appear to be realistic.

With the large numbers of sheep in Iran and their very diverse locations relative to feed supplies and consumer markets, the opportunity to assemble and feed is great. The magnitude of this opportunity is equalled or exceeded by the challenge of inducing owners to assemble, sell, and ship to feedlots.

Efforts to attract sheep by bartering feed for sheep does not appear to be successful. Whether it is the exchange rate, resistance to social change, inefficient or ineffective buyers, credit and other pressures from traditional buyers, or a combination of these and other factors is not known. The fact remains that the complexes for mutton and beef feeding, which are completed, under construction, or planned, will require over 8.5 million feeder sheep and over 400,000 feeder cattle annually. ^{1/}

Imperative to the effective functioning of a feeder marketing system that will provide enough feeder animals is a classification and grading program which can, with price, direct the flow of animals with feeding potential to the feedlots. With the price of feedlot rations in Iran and most of the world at a level which is sufficiently high that costs of gain are well above the live price of slaughter animals, the price of feeder animals must be considerably below slaughter prices if the feeding operation is to operate profitably. The grades for feeder livestock in Iran should be based on the animals' ability to perform in the feedlot and to produce a carcass that meets the carcass grade standards. While conformation is a major factor in feeder livestock grades, the thriftiness or general health condition factor is extremely important in Iran.

^{1/}Based on a list of complexes in the Tehran Journal, January 31, 1974. Assumed carcass weight for slaughter sheep is twenty kilograms.

The responsibility and authority to develop a classification and grading system for feeder livestock should be assigned to the Live-stock and Meat Standards Branch of I.M.O.

If a classing, grading, and pricing program is to be effective in moving animals to their most efficient use (slaughter or feeding), other factors must be made as simple as possible. A live animal weighing system with the value based on weight and quality eliminates one of the guessing games and places the buyer and seller on more equal terms.

Even with the introduction of live weighing, classification, grades, and other physical improvements, the current high cost of feed and the resulting high cost of feedlot gain, relative to the sale price of fattened livestock, make it difficult for the feedlot buyer to compete with the slaughter buyer for the available supply during most of the year. If subsidies to the feedlot sector are sufficient to lower costs of gain well below the sale price for fattened livestock, then feedlot buyers will be able to outbid the buyers of slaughter animals. These subsidies can be in the form of premium prices for fattened slaughter animals weighing above a specified live or carcass weight or in the form of below market prices of feed inputs. Another possible alternative is to eliminate the price ceilings on meat at wholesale and retail. This would permit realistic price differentials due to increased carcass yields from the heavier fattened animals and would give consumers the opportunity to express their desires with money in the market place.

Cattle fattening which has developed in Iran in recent years is still confined largely to the Tehran area and the feeder cattle inputs are composed mainly of bull and cull heifer calves from the commercial dairies. The major breed is the Holstein although some native cattle and other exotic breeds are fed for slaughter. For operations of this type and size, the supply of feeder cattle is not a major problem.

With the development of large commercial cattle feeding operations, the absence of a feeder marketing system is becoming apparent. The complexes, planned or completed, for beef production will require over 400,000 feeder cattle annually, as was stated. ^{1/} Very few of these are currently available from exotic dairy breeds. Therefore, this supply will have to be drawn from the native cattle population.

The cattle industry is unique in that, with the exception of some large dairy operations, the size of the herd of cattle owned by one person is generally quite small and the principal objective of

^{1/} The assumed carcass weight for beef is 300 kilograms.

the owner is not the production of feeder cattle. These factors, plus the almost complete lack of a marketing system for feeder cattle in the traditional system, will require effort and innovations to move quickly to a market oriented system that will provide cattle to the feedlots.

To encourage the procurement of feeder livestock by feedlots from remote areas of Iran where it is not economically feasible to pay commercial transport rates, a transportation subsidy will probably be required. A simple transportation cost difference may not be sufficient since weight and death losses will be much greater on livestock subjected to extremely long hauls over unimproved roads.

The effort to establish market or assembly points along migratory routes has not been very successful although it is essential if range pressure is to be relieved, migratory weight and death loss reduced, and supply needs of feedlots met. One factor which has limited the sale of such livestock by migrant herdsman has been the slow payment by buyers or, in some cases, no payment at all. Provisions must be made for payment at the time of sale if sellers are to have confidence in the system.

Marketing Education (Vol. 1, p. 44)

The development of a market oriented livestock and livestock feed industry requires much more than the construction of physical facilities and official declarations that methods and techniques must change. If the marketing segment is to efficiently direct production and the allocation of production resources, a marketing education program will be required. Producers must be educated to new market conditions and marketing people must be trained in the use of new market tools including classes, grades, live weighing, price differentials, and other new market factors.

Marketing education of producer and market groups should be the responsibility of the MANR Extension Bureau. Presently, this agency apparently has neither the authority nor the responsibility to conduct educational programs in the marketing of agricultural products.

To perform this function would require the establishment of a marketing section in the Extension Bureau and the training of experts in various commodity areas. The assignment of these experts in all producing areas of Iran will be essential although a central staff will be required to coordinate programs with other bureaus in the Ministry and to provide direction to the staff in the Ostans and smaller political subdivisions.

The observation and study of the U.S. Extension Service marketing programs (Federal and State) should be helpful in determining the scope and defining the potential marketing programs to be conducted by the Extension Bureau. The critical need for agricultural extension education may require the elevation of the status of extension in the Ministry.

While the extension marketing education program should include all economically important commodities, the most critical current need appears to be in the livestock and meat area. It is questionable whether significant increases in livestock production can be attained in village and other small flock and herd enterprises without a grass roots marketing education effort by a government agency capable of reaching these producers.

Feed Marketing System (Vol. 1, p. 46)

The availability of adequate supplies of livestock feeds (forages and concentrates), when needed, should be given priority if Ministry goals in meat production are to be approached. Increased production of livestock feeds can provide some relief but importation of feed-grains and protein concentrates will continue to furnish a significant portion of the nutrients required for greater livestock production.

Efficient use of domestic production and imported feeds will require increased capacity of feed processing equipment. The failure to supply feeds of proper quality in the quantity, time, and place needed has already curtailed meat production and emphasized the need for improved transportation and storage facilities.

The need to devote more resources to the critical area of livestock feed marketing was recognized early by the U.S.D.A. team and short term consultants from U.S.D.A. were recommended to supplement the team's efforts.

In addition to facility needs for storing, transporting, and processing of livestock feeds, special emphasis was to be placed on the study of the price structure for livestock feed stuffs and other commodities which compete for the same production resources. This would include the various incentives (price and input subsidies) which are extended in an effort to increase production of competing commodities. A common policy by the several Ministries which are responsible for commodity programs is a must if the most efficient allocation of production resources is to be reached and if unnecessary but costly competitive incentive programs between Ministries and agencies are to be avoided.

Livestock Slaughter Facilities (Vol 1. p. 48)

The livestock slaughter facilities available to serve the livestock and meat industry of Iran are, in most cases, inadequate to provide needed quantities of wholesome meat under the hygienic conditions needed and desired by the Iran Meat Organization. Refrigerated cooler space, if available at all, is usually inadequate. Therefore, carcasses are moved to meat shops without chilling and in many cases are cooked and consumed the same day. This lack of cooler storage capacity allows the meat marketing system very little flexibility in leveling out short run variations in meat supplies.

Two critical areas are involved and their solution can be worked out simultaneously. Current slaughter plant construction being completed under contracts will, when accepted, provide facilities in which hygienic slaughter can be done. Refrigerated cooler space is included. New modern abbatoirs at Fars Meat Complex and Ziaran Meat Company are under construction and will add significantly to capacity capable of maintaining desirable hygienic slaughter and adequate chilled storage. Additional facilities will be needed at some of the other locations called for in the Slaughterhouse Construction Program--Stages 2 and 3. Not all construction called for will be needed and the situation should be restudied in view of the development of complexes such as Fars, Ziaran, Kalda, and others, and possible reductions in livestock numbers.

The development of new facilities with cooler space for short term storage and cold storage for frozen meat does not automatically provide proper sanitation and the production of wholesome meat. A government agency with sufficient authority to adequately police slaughter and meat processing facilities is required to maintain proper conditions during livestock slaughter and meat handling operations. Animals should be inspected before slaughter and carcasses inspected during slaughter to prevent diseased or contaminated meat from entering trade channels.

The logical agency to perform this inspection service is the Veterinary Organization. It is not directly associated with the commercial meat industry, its veterinary expertise would be needed, and it could maintain an objective attitude.

An alternative agency would be a new group in an expanded Iran Meat Organization. Such an agency would need to be independent of the commercial agencies in I.M.O.

Cold Storage (Vol 1, p. 50)

The seasonality of production, the need to significantly reduce livestock numbers, and the rapid climb in the demand for meat has placed considerable pressure on existing cold store facilities. Unless additional, strategically located capacity is added, the Iran Meat Organization will not be able to continue to expand distribution and supply the larger quantities demanded by consumers.

Unless private cold stores in the vicinity of Bandar Shahpour and Khorramshahr are able to handle excess supplies of I.M.O. product, the capacity of the cold stores in that area must be expanded to provide space for rapid unloading of ships at those ports. With import needs expected to continue to increase, it seems logical to locate new facilities at Bandar Shahpour which would permit the handling of sealed, self contained units. These would speed unloading, protect the product from contamination and theft, and reduce storage needs in consuming centers. This type of facility would provide a flexibility not found in present facilities.

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The storage and distribution system in Tehran presently moves frozen carcasses to the municipal abbatoir for delivery to the depots where the mutton allocations are made to the shops. Traffic in the abbatoir area is heavy, the streets narrow, and extra handling is required. This increases the expense and the opportunity for contamination. In those seasons when a large percentage of the distribution of meat is from the cold stores, it is extremely difficult, if not impossible, to deliver an unfrozen product to the shops. These shops do not have space or equipment to properly defrost the meat, and consumer complaints are common.

New cold stores in large consuming centers should be conveniently located and the product should not move through the slaughter house enroute to shops. New equipment using micro-waves can provide rapid, controlled, dripless thawing that will improve appearance and quality over present methods. Whether this should be located at the cold store or at the distribution depot should be studied.

Wholesale and Retail Distribution (Vol. 1, p. 52)

The wholesale and retail meat distribution system varies greatly but still includes many small, low volume shops. These holdovers from the traditional marketing system seem to have little opportunity to develop sufficient volume to be efficient units capable of providing satisfactory retail meat service under sanitary conditions.

Some semblance of market orientation exists in Tehran and perhaps some other cities. Nevertheless, many of the over 2,000 guild shops in Tehran handle such a small average volume that it is not economically feasible for them to provide adequate chill facilities and cutting equipment to properly maintain product and efficiently utilize labor. Meat retailers, even under a controlled price situation, should be allowed to set prices on individual cuts so as to facilitate an even flow of all cuts from the carcass. This would reduce waste and allow the retailer to cater to the desires of consumers in his locality. Marketing of meat is a disassembly process, and price is the most effective mechanism to insure uniform product flow.

Municipalities in Iran have traditionally maintained jurisdiction over slaughter of livestock and distribution of meat at wholesale and retail. Regulation and control has not kept pace with industry development and needs. Most cities find themselves without adequate, properly trained personnel to inspect and police their meat trade. Some centralization of meat industry regulation and control appears to be essential if unlawful, unsanitary slaughter is to be minimized and the wholesale and retail meat distribution systems operated to provide wholesome meat products to consumers. If municipalities insist on continuing to maintain authority over the regulation of the wholesale and retail meat distribution system, then they must accept the full responsibility for the conditions that exist and any food poisoning that occurs as a result of these conditions. The municipal authorities need, and may be willing to accept, technical assistance in developing regulations and effective control programs.

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Iran Meat Organization programs on slaughter, storage, packaging, and distribution should be expanded and present programs should be improved. The recently started construction on the packaging and distribution center in Vanak will provide additional tonnage of well-chilled, packaged meat and will be a base for practical research on the types of cuts and qualities of meat desired by Tehran consumers.

Additional installations of this type will be needed to provide the increased quantity and the improved quality of meat desired by Iranians. Consequently, more installations are recommended.

Market Information (Vol. 1, p. 54)

The reporting of current prices and movement of agricultural commodities should not be restricted to livestock, meat, and livestock feeds. However, the need is possibly as great for these as for any other commodity. If the livestock industry--production and marketing--is to operate efficiently, it must be able to rely on accurate and timely market information that is adequate in volume and coverage.

The collection and dissemination of market supply, demand, and price information must be performed by an independent agency which is as objective as possible. In most countries with market oriented systems, this function is done by professionals in a governmental agency. In Iran, the MANR or the MCRA are two possible locations for a market news agency.

In Iran, the many small producers of livestock are at a disadvantage when dealing with relatively knowledgeable buyers. While a livestock market news system which provides current, accurate information on price and supplies in important market areas will not put the buyer and seller on equal footing, it will significantly improve the bargaining position of the small seller and will, perhaps, provide incentive to increased production. Efficiency of the marketing system will be improved.

E. AGRICULTURAL RESEARCH, EXTENSION, AND EDUCATION (Vol. 1, p. 56)

Strong research, extension, and education programs are needed to guide the rapid improvement in production of animal feed, both on rangelands and on cultivated land, and production of livestock and livestock products. Following is additional discussion of research, extension, and education problems outlined in Volume I.

Agricultural Research (Vol. 1, p. 57)

Progress in agricultural research is absolutely dependent upon adequate numbers of trained people dedicated to their profession. In any country, relatively few graduates of colleges and universities

have the necessary intelligence level, intellectual curiosity, and aptitude for the hard, often tedious, work required to be productive scientists. In today's scientific world, three to five years of training beyond the B.S. degree is typically required as a foundation upon which a productive career in research may be built.

With the fact that higher education is, for practical purposes, a development of the past three decades in Iran, shortages of adequately trained people for research are not surprising. It is a real tribute to Iran that for the past 40 years or more the country has had a nucleus of people capable of developing some scientific units in agriculture which rightfully enjoy a worldwide reputation for excellence. The Razi Institute is the best known in the fields related to animal production.

Razi Institute and some other units have had flexibility to pay salaries above basic civil service levels. This has been an aid in attracting and retaining competent staff. Other units have not had this authority and, as a result, it has been impossible to recruit and retain even the limited number of available trained people for research positions. Many of these people have gone into other areas where they found opportunities and rewards to be greater.

Total numbers of people trained in agriculture and for agricultural research in Iran have been lower than needed due, in part, to past failure of universities to understand the needs of the country. They have not given either the emphasis or dignity to agricultural education to produce the needed trained manpower.

Administration of research has been scattered in many organizations and institutes--some of which have multiple responsibilities of which research is only one. Under this situation it was inevitable that, for at least some groups, research had lower priority than other activities. Thus, insufficient numbers of scientists were hired and those on the staffs were not adequately supported.

Fortunately, the problem has been recognized and steps taken to correct it. Legislation was recently passed to bring all agricultural research into a single organization and to provide for salaries to scientists based on research productivity.

Steps are now being taken to implement the provisions of the legislation. Two members of the U.S.D.A. team worked actively on certain phases of these plans. We believe the plans are being soundly developed and that their implementation should have the highest priority in the Ministry.

Critical Research Needs Related to Livestock Production

There is need for a broad program of agricultural research with emphasis on important problems, the solution of which will contribute in relatively short time spans to improvement of production and

efficiency. We believe the items listed below are especially important in relation to livestock, cropland, and range production.

A. Livestock Production and Health:

1. Management systems

Studies of how best to combine inputs of pasture and range, harvested feed, buildings, labor, and other factors to maximize production relative to costs.

Incorporation of sanitation, vaccination, use of chemotherapeutic agents, and other approaches for disease and parasite control is an integral part of the research.

2. Germ plasm evaluation and breeding systems

Especially with sheep and goats to determine the breeds or breed crosses which will be most productive and profitable under different production situations, i.e., range, confinement rearing, etc.

3. Improving reproductive rates

This is basic to improving efficiency of livestock production in Iran. Studies should include effects of genetic differences, nutritional levels, hormone treatments, and management variables. Research to improve efficiency of artificial insemination in farm, village, and range herds and flocks should be included.

4. Composition and utilization of by-product feeds

As discussed elsewhere in this report, poor utilization of by-products is a fundamental problem of livestock production in Iran. Research to determine nutritive value and most efficient methods of feeding is needed.

B. Cropland Production to Support the Livestock Industry:

1. Production of livestock feeds on irrigated lands including pastures and both grain and silage from maize and sorghum. These high-yielding crops are not contributing anywhere near their potential.

2. Potential of forage production as an alternative to abandoned fallow on irrigated land, and clean fallow or forage on rainfed land. Double cropping, using a winter annual on irrigated land, and clean fallow on rainfed land are in particular need of research.

3. Efficient water use in all crop production, with emphasis on rotations that include forage crops that produce more livestock feed.
4. Wheat and barley breeding for rainfed lands, to increase yield per hectare, to release irrigated land to grow forage.

C. Forage Production on Rangelands:

1. Grazing management. Studies on season, duration, and intensity of range use as related to livestock productivity and to preservation and improvement of ranges.
2. Range seeding. Studies of seeding methods for restoring depleted ranges or abandoned croplands.
3. Seed production for range seeding. Studies to determine cultural practices for maximizing seed production for rangeland seeding.
4. Breeding better forages for range use. Intensive breeding and selection studies to identify or produce superior strains for range seeding.
5. Range ecology. Studies of species and plant associations under naturally occurring and seeded situations. Determination of those species most valuable to man and factors affecting their vigor and longevity.

Extension (Vol. 1, p. 59)

MANR is responsible for most agricultural extension activities. It operates the Agricultural Extension Training Center at Karaj where it trains Extension Service personnel, members of the Extension and Development Corps, and also conducts specialized courses for MCRA personnel.

There are approximately 66,000 villages in Iran, a very small percentage of which have Extension and Development Corpsmen stationed in them. There are no extension agents in the villages, these being located in the larger towns located in the Ostans. Consequently, extension agents have little or no direct contact with farmers in the villages. At present there are about 1,050 extension agents and 125 extension supervisors in the Extension Service. The MCRA also has a number of extension agents working with farm corporations and production cooperatives. In addition to the Extension Service, MANR has

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supervisors in the Extension Service. The MCRA has
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tion companies. In addition to the Extension

extension activities in the Soil Institute, the Plant Protection Institute, the Sugar Beet Improvement Organization, and other agencies working on special crops. With all of this, the number of extension personnel in Iran is still far less than is needed for an effective agricultural program.

A number of reports have listed the achievements and shortcomings of agricultural extension efforts in the country. All agree that the number and quality of extension personnel must be increased before any real impact will be made in the agricultural sector. These reports have also pointed out the lack of coordination between extension, research, and agricultural education. And several reports have commented upon the duplication of extension functions that occur even within a single ministry.

The program outlined in Volume 1 aims at eliminating or at least greatly reducing the overlapping functions by centering all agricultural extension activities in one agency. It also proposes that extension be raised to the deputy ministry level. This will provide extension with the status it needs to fully develop its activities. It will also provide for much better coordination between extension and research. The number of personnel involved and the importance of the work fully justifies the deputy ministry status for extension.

An alternative solution, in reality, could prove to be a better solution in the long run to the problem of coordination between extension and research. This would involve placing extension and research under a single deputy minister. Part of the function of the deputy minister would be to see that the two agencies worked closely together. However, such an administrative arrangement is probably premature. The research program in Iran has recently been given new status and will require several years to begin functioning effectively. To burden this deputy ministry with a reorganized extension service would create too many stresses for the proper functioning of either extension or research. Consequently, it is felt, that for the time being, it will be better to raise extension to the deputy ministry level and develop the organization fully. Later, once both organizations are functioning properly, they could be placed under a single deputy minister in order to obtain the maximum coordination of their efforts. Until such time, the Minister will have to carry out this coordinating function.

Some comments appear necessary to put the magnitude of the extension job in perspective. There are over 2.5 million farms in Iran. There are perhaps 1,800 full-time extension workers in Iran in all agencies (excluding the Extension and Development Corps), or one for every 1,500 farms. In the United States, there are about 2.5 million farms and 16,500 full-time extension workers, or one for every 150 farms. In addition, there are about 12,000 para-extension workers (non-university trained personnel, working mainly in community and home projects). Private industry also employs large numbers of field men (feed servicemen, veterinarians, machinery

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workers (non-university)
family and home program
numbers of field work

servicemen, fertilizer specialists, soils men, etc.). The latter may add up to 10,000 specialists to whom farmers can turn for assistance. If Iran were to develop the same personnel infrastructure, it would need over 30,000 extension-type personnel working with farmers and farm families. Even counting the Extension and Development Corps, this number in Iran would not exceed 5,000 at present.

A complete study needs to be made of the Extension Service and all related extension activities to determine ways the whole program can be more efficient and effective. This will be a start. After the study, a program should be developed and given the full support of the Government to assure that farmers in Iran receive the assistance they need in order to become modern, efficient producers.

Agricultural Education (Vol. 1, p. 61)

Of all the needs in agriculture, education is the most critical. It has been recognized as such by the GOI and various efforts have been and are being made to provide trained personnel. An Education Task Force is surveying all of the needs of the country. A recent study by a consulting firm has provided some data on manpower needs for agriculture. There is need for top level farm managers, second and third level farm managers, farm branch managers, managers of farm corporations and production cooperatives, supervisors for rural cooperatives, managers of processing plants, credit advisors, technicians for private and public farms and for research and extension, accountants, and skilled workers for agriculture and industry. The total needs (excluding Ministry of Interior village headmen) will amount to approximately 25,000 by the end of the Fifth Plan. The expected output of vocational schools, the Farm Management Institute, the universities, the Extension and Development Corps, etc. will be about half this amount. And, of these, many will not continue to work in agriculture.

There is not time to train sufficient personnel for the programmed requirements of the Fifth Plan. If an adequate program were mounted now, it is possible that the requirements for trained manpower could be met by the end of the Sixth Development Plan (1982).

It is proposed that all agencies concerned with trained manpower in agriculture form a coordinating agency to develop an overall training program. This agency would work closely with the Educational Task Force. It would go beyond the mere compilation of numbers of trained manpower required. It would develop a program for construction of buildings and purchase of equipment, the training of instructors, and the preparation of the curricula for each level.

In the past, the programs of higher education for agricultural studies have tended to be apart from the other educational programs in agriculture. Graduates of the universities have considered

The first part of the report deals with the general situation of the country and the position of the various groups of the population. It is a very general survey and does not go into details.

The second part of the report deals with the economic situation of the country. It is a very general survey and does not go into details.

The third part of the report deals with the social situation of the country. It is a very general survey and does not go into details.

The fourth part of the report deals with the political situation of the country. It is a very general survey and does not go into details.

The fifth part of the report deals with the cultural situation of the country. It is a very general survey and does not go into details.

The sixth part of the report deals with the military situation of the country. It is a very general survey and does not go into details.

In the past, the program of higher education in agriculture. Graduates of the university have tended to be sent to the country to work on farms. This is a very general survey and does not go into details.

themselves an elite class and have shunned work that involved physical labor or getting one's hands dirty. Iran's agriculture cannot develop fully with such an attitude and some means must be found to convince college graduates that they need to involve themselves physically as well as mentally in the task of transforming Iran's agriculture. The proposed coordinating agency should study ways whereby this can be achieved.

F. COORDINATION (Vol. 1, p. 64)

A well-coordinated and technically strong system of policy making will help Iran significantly in reaching its agricultural goals. Problems presented in Volume I included (1) coordination of MANR and MCRA planning bureaus, (2) agricultural statistics, (3) evaluation of farming systems, and (4) coordination and cooperation among MANR bureaus. Further discussion of some of these problems follows:

Coordination Between MANR and MCRA Planning Bureaus (Vol.1, p.65)

Agriculture is so interconnected that it is not possible for separate agricultural agencies to plan in isolation. Even when there are coordinating mechanisms (such as the Plan and Budget Organization), the result is never as satisfactory as when sector planning is done by one agency. Also, since planning requires an integrated set of program objectives, planners not only must have a common objective but they must develop all programs with a view toward obtaining these objectives.

Iran has two ministries whose primary functions are to work in agriculture. This complicates any attempt at integrated planning. But, because the integrated approach is absolutely essential, the attempt here is to develop a way to accomplish integrated planning.

MANR has responsibility for most livestock and crop development (including research, extension, and vocational agriculture). It also is responsible for the development of large agro-industrial and meat complexes. The Ministry of Cooperation and Rural Affairs (MCRA) has as its primary responsibility the development of co-operatives, which means working with most of the farmers in villages.

Many complications arise with such a divided arrangement. For example, MANR has responsibility for the development of rangelands; the MCRA is assisting farm cooperatives to produce more wheat and other grains. As a result, large areas of former rangelands have been plowed up for wheat, leaving less grazing land for livestock producers. A planner in the MANR may program more rangeland improvement in order to expand livestock production, whereas a planner in the MCRA may be looking upon this land as a way to increase wheat production in the country. Unless there is an integrated approach, this conflict

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cannot be solved and any plans that are made based upon the separate approaches will have little meaning. This is only one example of the many conflicts that arise when there are separate approaches to planning in agriculture. The Plan and Budget Organization (PBO) attempts to resolve these differences but there is ample evidence that it has not been successful. It has neither the manpower nor the ability to adequately bring the plans of the two ministries into coordination.

The proposal here is to develop one overall agency for agricultural planning. In Volume I, pages 65 to 66, we proposed the establishment of a Center for Agricultural Planning in Iran (CAPI). Such a planning unit would necessitate the two ministries coordinating their long-term plans. It would also enable the two ministries to program their manpower to avoid duplication.

The foundation for CAPI already exists. Both ministries have planning bureaus. The Plan and Budget Organization has an agricultural section. Personnel from these three agencies could form the nucleus of CAPI. However, additional personnel may be needed. This is so because none of the planning bureaus are adequately staffed at present and, even with an amalgamation, it is likely that more will be needed to do an adequate planning job.

Branches of CAPI would be maintained in each ministry and there would be liaison with PBO through one or more representatives of PBO serving on the board of directors. CAPI would prepare the annual plans as well as the major part of the agricultural section of the five year development plans. The final part of the five year plan would be in cooperation with PBO.

The major problem to be faced by CAPI will be how to have planning authority for two separate ministries. Perhaps this could best be overcome by having such authority flow from a cabinet committee on coordination that would be attached to the Prime Minister's office. This would also be useful where other inter-ministry coordination was desirable.

The PBO is developing regional planning bureaus in each Ostan. Agriculture will be an important part of these bureaus since agriculture is an important part of each Ostan. Any regional agricultural planning should be the responsibility of CAPI since it must coordinate the entire agricultural planning process.

Statistics (Vol 1, p. 67)

Several agencies are involved in gathering statistical data relating to agriculture. Both ministries working in agriculture--MANR and MCRA--have statistical bureaus. The Iran Statistical Center (ISC) also collects agricultural data. No doubt other agencies also collect data relating to agriculture. Data collection, processing, and dissemination is a highly technical and costly operation and every effort should be made to make it efficient.

Since agricultural data are indispensable to proper agricultural planning and to making policy decisions, it is proposed that a single agency be established to collect, process, and disseminate agricultural data. This agency would be tied very closely to the proposed Center for Agricultural Planning in Iran since much of the data would be for use by CAPI for planning purposes.

It is proposed that the new agency be called the Agricultural Statistical Center of Iran (ASCI). It would absorb personnel of the two ministries which are currently engaged in developing statistical information. It would employ additional personnel as needed, especially if it takes over some of the statistical responsibilities now handled by other agencies. Assistance could be obtained from expatriate statisticians as needed.

The ISC would continue to gather census data as in the past, but all data relating to annual production, farm inputs, costs, etc. would be the responsibility of ASCI, as would special studies required by various agricultural agencies.

Coordination would be obtained by having representatives from the two ministries, CAPI, ISC, and other agencies on the board of directors of ASCI.

Evaluation of Farming Systems (Vol. 1, p. 69)

The Government of Iran is to be commended for its recognition of the problem of increasing agricultural production and for its courage and vision in attempting several approaches. It probably would have been impossible at the outset to predict which of these approaches would be most effective in accomplishing the goals of increasing production and improving efficiency of production within the constraints of existing social systems, educational levels of farm populations, patterns of land ownership, available managerial talent, and other factors.

Any approach which necessitates combining small blocks of land owned by individual farmers for greater production efficiency inevitably entails some sacrifice of individual freedom of action for some or all of the original owners. The degree to which the action taken results in increased income opportunities and greater potentials for social progress for the people involved determines to a very great degree the acceptance of the new approach. If accepted, the enthusiasm of the participants will be an important factor in its success.

There comes a time when the data from any experiment must be summarized, analyzed, and conclusions drawn. Such conclusions are needed now to guide future developmental efforts.

The fact that some approaches will undoubtedly be found to have been more successful than others in no way reflects upon the persons who have tried the less successful. There should be no penalties involved.

The recommended study could well find shortcomings in all approaches used thus far. Careful study would then permit suggestions for modification to increase effectiveness.

G. ADMINISTRATION (Vol. 1, p. 73)

The senior officials of large organizations with complex functions need a well organized administrative system with skilled staff. Problems outlined in Volume I were (1) administrative procedures, and (2) effective use of consultants. Further discussion of these topics follows.

Administrative Procedures (Vol. 1, p. 74)

We have stated that there are serious administrative management deficiencies in MANR, but we also must stress that this is in no sense an isolated situation. Virtually every organization has problems.

The fact is also stressed that the problems listed are not universal in the Ministry. Some persons and some units have already gone far in solving critical problems. However, in most units inadequate administrative procedures are critical stumbling blocks to efficiency.

Our appraisal of the problems of the Ministry indicate that the following are most important:

1. Authority and responsibility are not delegated far enough down the line.

The result is that Deputy Ministers and Directors-General spend unnecessarily high percentages of their time signing papers and taking other actions on routine and minor matters. They then have insufficient time for mature in-depth consideration of the important matters relating to overall policy and long-range planning.

We recognize fully that delegation of authority and responsibility is dependent upon the presence in an organization of personnel both willing to accept it and capable of performing in a satisfactory manner. For this reason, this recommendation has a major training component.

2. Inordinate numbers of signatures must be obtained to accomplish the simplest routine action.

This burden of red tape is closely related to Item No. 1. The effect is long delays in accomplishing even the simplest actions. The cumulative effects of these delays is geometric and effectively destroys the ability of the Ministry to act on critical problems.

3. Staff functions are inadequately developed and not separated clearly from line functions.

The effect of this is that high-level administrators spend time on matters which could be handled by staff people. The final result is the same as that of Item No. 1--too little time of top people for the really important matters.

4. Large numbers of young, capable, well-trained people are employed by the Ministry in positions in which their talents are under-utilized or they do not have enough work of any kind to keep them occupied.

This situation is nothing short of tragic. Iran is short of trained people and its future depends upon full utilization of those she has. We believe the problem exists basically because the pattern of administration generally is from the top down. Top people just don't have time to devise programs to utilize everyone on the salary rolls and no one further down has the authority to do so.

Like most other problems of an organization, these cannot be solved solely by actions of top people. Rather, we believe progress on them can be made only by an educational process in which people at all levels of the organization are indoctrinated with basic principles of good management. Accompanying the educational efforts must be a philosophy from top management of encouraging and rewarding lower level employees for suggestions and actions simplifying management procedures and for willingness to assume authority and responsibility.

Effective Use of Consultants (Vol. 1, p. 77)

During the period the U.S.D.A. Team was in Iran, it learned of the presence of well over 20 agricultural advisory and consultant groups from a number of other countries or representing international organizations. The team had contacts with many of these and, at the suggestion and direction of the Ministry, worked quite closely with some.

2. Therefore, the number of staff functions must be obtained in accordance with the simplest routine action.

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4. Large numbers of young, capable, well-trained people employed by the Ministry in positions in which their talents are under-utilized or they do not have enough work of any kind to keep them occupied.

This situation is nothing short of tragic. It is a short of trained people and the future of the country is in jeopardy. Full utilization of those who are in the Ministry is a problem which exists basically because the pattern of administration generally is from the top down. People just don't have time to devise programs which utilize everyone on the salary rolls and no further down has the authority to do so.

Like most other problems of an organization, these cannot be solved solely by actions of top people. Rather, we believe progress can be made only by an educational process in which people at all levels of the organization are indoctrinated with principles of management. Accompanying the educational process must be a management of encouragement and rewarding lower levels for suggestions and actions simplifying management and for willingness to accept authority and responsibility.

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Most if not all of these groups are made up of dedicated people sincerely interested in aiding the development of Iran's agriculture. Almost without exception, however, they feel they are less effective than they could be if the Ministry were better able to provide essential services.

The situation was commented on by the International Bank for Reconstruction and Development in a 1974 report as follows:

"Despite the generally high quality of top level management, these agencies are understaffed and lack sufficient trained administrative and technical personnel to execute their increased responsibilities. Heavy use is made of consultants, yet because of the work load in the Ministries, terms of reference are often poorly drawn up and selection and supervision procedures are inadequate. Consequently, much of the input provided by consultants is of poor quality and is ineffectively used."
(IBRD. 1974)

The situation was also commented upon by the Hunting and Bookers group in their First Interim Report on development of a National Cropping Plan. This group listed more than 20 items which they felt were needed for study or review in order to fulfill their mission in the best possible manner. For some reason these items had not yet been made available for their use.

In total, the Ministry is spending a great deal of money on advisory and consulting groups. Obviously, it is in the best interest of the country to utilize the talents and experience of these people to the fullest.

We recommended in Volume I, pages 77-79, a small group with the possible title of "Consultants' Coordinating Unit," responsible directly to the Office of the Minister, and with no other duties. Such a unit would go far to remedy the situation which now exists. To be fully effective, the activities of the group would have to be supplemented with an increased open atmosphere throughout the Ministry. The Minister should clearly set policy in this regard.

H. SELECTED BIBLIOGRAPHY

Abdullah, Mohamad, Agricultural Extension in Iran: A Preliminary Analysis. FAO. Tehran. 1973.

_____, Terminal Report on Improving Effectivity of Agricultural Extension in Iran. FAO. Tehran. Aug. 1974.

Almquist, Bjorn, Sheep Production Project Report for Sherkate Sahami Dasht Morghab, Tehran. Malmoe, Sweden. Nov. 1973.

American Society of Agronomy. Alfalfa Science and Technology. Agronomy Series 15. 1972.

_____, Forage Economics-Quality. Spec. Pub. 13. 1968.

_____, Forage Plant Physiology and Soil-Range Relationships. Spec. Pub. 5. 1964.

_____, Irrigation of Agricultural Lands. Agronomy Series 11. 1967.

_____, Maximum Crop Yields - The Challenge. Spec. Pub. 9. 1967.

_____, Moving Off the Yield Plateau. Spec. Pub. 20. 1971.

_____, Physiological Aspects of Crop Yield. ASA Symposium. 1969.

_____, Plant Environment and Efficient Water Use. ASA Symposium. 1967.

American University, Area Handbook for Iran. For. Areas Stud. Div. Washington, D.C. 1963.

Arnon, I. Crop Production in Dry Regions. Two volumes. Barnes and Noble. 1972.

Bahrani, B., M.B. Shoosterian and M.J. Haeri, Water Supply of Shiraz Valley and its Comparison to Water Requirements of Crops. Sixth Near East - South Asia Regional Irrigation Practices Seminar. Amman. March 19-30, 1966.

Barter, P.G.H., "Special Problems of Agricultural Planning." Monthly Bul. of Agr. Econ. and Stat. Vol. 11, No. 6. Rome. June 1962.

Battelle Memorial Institute, A Cooperative Program to Incorporate Sophisticated Analytical Techniques Into the Planning Procedures of the Ministry of Agriculture. Research proposal to Min. of Agr. and Nat. Res., Tehran. May 1, 1973.

Bauer, Armand, and others, Crop and Range Response to Added Growing Season Rainfall. Coop. Ext. Serv., N. Dak. St. Univ. Fargo. Undated.

Bookers Agricultural and Technical Services, Ltd., Programme for the Formulation and Implementation of a National Cropping Plan. London. Nov. 1973.

Boykin, Calvin C., Pasture and Fodder Crop Investigations: Contribution of National Rangelands to the Economy of Iran. Tech. Rpt. 2 FAO/UNDP. Tehran. 1972.

Campbell, J. Baden, Experimental Methods for Evaluating Herbage. Canadian Dept. of Agr. Pub. 1351.

Carocci-Buzi, V. P., Forest Range Management. FAO/UNDP. Tehran. 1954.

Central Treaty Organization, Report on CENTO Workshops on Marketing of Livestock and Their Products: Pakistan, Iran and Turkey. April, 1971.

_____, Proceedings of the CENTO Conference on the Development of Feed Resources and Improvement of Animal Feeding Methods in the CENTO Region Countries, Ankara, Turkey. London. 1972

_____, CENTO Seminar on Agricultural Aspects of Arid and Semi-Arid Zones. Tehran. 1972.

_____, Seminar on Agricultural Planning. Tehran. 1972.

Chini, A. and P. Muhlig-Versen, Crop Calendar for Wheat, Barley, Rice, Onions, Potatoes, Cotton and Sugar Beets. Cen. for Agr. Mktg. Dev. Tehran. Mar. 1973.

Clawson, Marion., General Review of Overall National Planning in Agriculture. Resources for the Future, Inc. Washington, D.C. No date.

Cook, C. Wayne, "Energy - A Critical World Resource." Rangeman's News, Vol. 5, No. 5. Oct. 1973.

Cornett, Elgin M., Improving Iran's Agricultural Extension Organization. FAO. Tehran. 1973.

_____, Report on Project Results: Conclusions and Recommendations. An. Husb. Res. Inst. FAO/AGA: SF/IRA 8. Tehran. 1972.

Crop Science Society of America. Anti Quality Components of Forage. Spec. Pub. 4. 1973.

_____, Drought Injury and Resistance in Crops. Spec. Pub. 1. 1973.

Currier, W. F., Water Harvesting by Trick Tanks, Rain Traps, and Guzzlers. Forest Service, U.S.D.A. Albuquerque, New Mex. Undated (about 1973).

Dalrymple, Dana G., Development and Spread of High-Yielding Varieties of Wheat and Rice in the Less Developed Nations. Econ. Res. Serv., U.S.D.A. FAER No. 95. In cooperation with USAID. July 1974.

Demiruren, A.S., The Development of the Sheep and Mutton Production in Iran Through the Partial Settlement of the Nomadic Tribes. FAO/UNDP. Tehran. Feb. 1970.

Development and Resources Corporation, Agribusiness Opportunities. Special report prepared for Kuzestan Water and Power Authority. Iran. June 1969.

Dewan, M.L. and J. Famouri, The Soils of Iran. Joint project of FAO/UN and Soils Institute. Tehran. 1964.

Eberhart, S.A., and G.F. Sprague, "A Major Cereals Project to Improve Maize, Sorghum and Millet Production in Africa." Agronomy Jour. 65: 365-373. 1973.

Echo of Iran, New Land Reform Regulations Law (Amended). Supplement No. 122. Tehran. July 1964.

_____, Forestry Nationalization Law & Regulations: Forest Protection & Operation Regulations. Supplement No. 125. Tehran. Oct. 1964.

_____, Report on Five Years of Land Reform. Supplement No. 138. Tehran. Sept. 1967.

_____, Forests & Pastures Protection Law. Supplement No. 139. Tehran. Oct. 1967.

_____, Amendment of Forest Development Law. Vol. XV, Supplement No. 123. Tehran. 1969.

_____, Amendment of Forest Development Law (ii). Vol. XV, Supplement No. 124. Tehran. 1969.

_____, Forestry Protection Law Amendment (iii). Vol. XV, Supplement No. 125. Tehran. 1969.

_____, Forestry Protection Law Amendment (vii). Vol. XV, Supplement No. 129. Tehran. 1969.

_____, Forestry Protection Law Amendment (viii). Vol. XV, Supplement No. 130. Tehran. 1969.

_____, Forestry Protection Law Amendment (ix). Vol. XV, Supplement No. 131. Tehran. 1969.

_____, The New Land Reform Law. Supplement No. 162. Tehran. Apr. 1969.

Evenari, M. I., Shanan, N. Tadmor, and Y. Aharoni. "Ancient Agriculture in the Negev." Science 133: No. 3457. 979-996. 1961.

Farlane, J.F. and M. Zamani, The Marketing of Wheat and Barley in Iran with Particular Emphasis on Grain Storage. FAO/UNDP, Cen. for Agr. Mktg. Dev. Tehran. Oct. 1972.

Fink, D.H., K.R. Cooley, and G.W. Frasier, "Waxtreated Soils for Harvesting Water." Jour. of Range Management, Vol. 26, No. 6. Nov. 1973.

Firouz, Eskandar, Environment Iran. National Society for the Conservation of Natural Resources and the Human Environment. Tehran. Mar. 1974.

(FIS) Consulting Engineers, Preliminary Project; Mohim Agricultural Animal Husbandry Collectives. Tehran. Khordad 1953 (June 1974).

Fisher, W.B. ed., The Cambridge History of Iran: The Land of Iran. Vol. 1. Cambridge Univ. Press. 1968.

FMC International, Animal Protein Program, Iran: Interim Report 1. Tehran. July 1973.

_____, Animal Protein Program, Iran: Interim Report 2. Vols. 1. and 2. Tehran. Mar. 1974.

_____, Animal Protein Program: Iran: Interim Report 3. Vols. 1 and 2. Tehran. July 1974.

_____, How FMC Studies Rangelands with Satellite Photography. Tehran. Mar. 1974.

Food and Agriculture Organization/U.N., Integrated Planning of Irrigated Agriculture in the Varamin and Garmsar Plains, Iran. Tech. Rpt. 5. Tehran. 1971.

_____, Report on Land Resources and Potentialities of Gorgan Region. Pub. No. 173. Soil Institute. Tehran. June 1971.

_____, Pasture and Fodder Crop Investigations Project. Interim Rpt. Tehran. 1970.

_____, Pasture and Fodder Crop Investigations Project. Tech. Rpt. Tehran. 1970.

_____, Iran: Public Service Reform and Training. Report of the Review Mission. Tehran. Apr./May 1972.

_____, Traditional Farming in the Dez Pilot Irrigation Project Area: Survey of Thirty-six Villages. Cen. for Agr. Mktg. Dev. Tehran. May 1972.

_____, Pasture and Fodder Crop Investigations - Terminal Report on Project Results, Conclusions, and Recommendations. Rome. July 1972.

_____, Notes on Fertilizer Marketing in Iran. Cen. for Agr. Mktg. Dev. Tehran. Oct. 1972.

_____, The Movement of Agricultural Commodities by Rail. Cen. for Agr. Mktg. Dev. Tehran. Dec. 1972.

_____, Report on the Collection of Wholesale Prices of Agricultural Products (July 1971-Mar. 1972). Cen. for Agr. Mktg. Dev. Tehran. 1972.

_____, Agricultural Market News Service. Cen. for Agr. Mktg. Dev. Tehran. 1972.

_____, Production Yearbook. Rome. 1972.

_____, Country and Inter-country Programming - Iran - UNDP Assistance Requested by the Government of Iran for the Period 1973-77. Rome. Mar. 30, 1973. Restricted.

_____, Perspective Study of Agricultural Development for Iran-Central Policy Paper. Policy Analysis Div. Rome. July 1974. (Unpublished)

Forages (3rd Edition) Iowa State Univ. Press. Ames. 1973.

Ford Foundation, Summary Report on the Regional Sheep and Forage Production Workshop. Beirut. Oct. 1974.

Fowler, W.B. and J.D. Helvey, "Effect of Large-Scale Irrigation on Climate in the Columbia Basin." Science, Vol. 184, No. 4133. Apr. 12, 1974.

Goodwin, D.L., Pasture and Fodder Crop Investigations - Project Results, Conclusions and Recommendations. FAO/UNDP. Tehran. 1972.

Harris, Karl, Leonard J. Erie, and Wallace H. Fuller, Minimum Tillage in the Southwest. Bul. 39. Agr. Exp. Sta., Coop. Ext. Serv., Univ. of Arizona. Tucson. Apr. 1969.

Haverkamp, Leonard J., Iran Reconnaissance Survey. Wilson & Co., Inc. and the Agribusiness Council, Inc. Chicago. Nov. 1970.

Hawaiian Agronomics Company (International), The Study of Animal Husbandry and Agricultural Complex of Moghan Region: Reconnaissance Survey and Preliminary Investigation. Tehran. Dec. 1971.

Haynes, J., Potentials for Increased Production of Livestock Feed in Iran. USAID. Tehran. Oct. 1965.

_____, Crop Zones of Iran. USAID. Tehran. Oct. 1965.

Higgs, E.D., The Major Southern Australia Farming Systems, Their Herbage Plant Species and Cultivars and the Possible Significance of These to China. S. Australia Dept. of Agr. Undated.

Hillel, Daniel, Infiltration and Runoff as Affected by Soil Conditions. The Hebrew University of Jerusalem, Faculty of Agr. Rehovoth, Israel. 1974.

Hunting and Bookers, National Cropping Plan: Inception Report. Vols. 1, 2 & 3. Min. of Agr. and Nat. Res. Tehran. Aug. 1974.

Industrial Management Institute, Suggestions for Organizing the Ministry of Agriculture and Natural Resources. Vol. 2. Tehran. Nov. 1972.

International Bank for Reconstruction and Development, Agricultural Sector Review-Iran. Vol. 1. Tehran. 1970.

_____, Agricultural Sector Review-The Livestock Economy. Annex 4. Tehran. 1970.

_____, Agricultural Pricing Policy in Iran - Some Considerations in the Framing of an Effective Policy. Iran Agricultural Task Force. Tehran. Nov. 6, 1973.

_____, Current Economic Position and Prospects of Iran. Annex 1, Iran Agricultural Task Force. Tehran. Jan. 30, 1974.

_____, Dairy Policies in Iran: Some Thoughts and Impressions. Iran Agricultural Task Force. Tehran. Jan. 30, 1974.

_____, Dairy Policies in Iran: Some Thoughts and Impressions. Iran Agricultural Task Force. Tehran. May 14, 1974.

_____, Agricultural and Rural Policy Issues in Iran, 1974. Iran Agricultural Task Force. Tehran. June 9, 1974.

International Maize and Wheat Improvement Center, CIMMYT Annual Report 1972 on Maize and Wheat Improvement. Mexico City. 1972.

Iraust Agricultural Development Consultants, Kermanshah Agriculture and Livestock Development Project: Final Report. Vols. 1,2,3,4, and 5. Tehran. Nov. 1974.

Jones, Richard G., Sheep Industry in Iran. USAID. Tehran. 1974.

Kansas Water Resources Board, Kancup 73 - A Cloud Seeding Program for Western Kansas. Topeka. 1974.

Keller Engineering, A Basic Approach For Increasing Iranian Meat Production. Logan, Utah. June 1969.

Keller, Wesley., Proposed Revision of the Range Research Program on a Regional Basis. Memo to Parviz Mehdizadeh, Research Institute for Forests and Rangelands, Tehran. Oct. 3, 1974.

Kernick, M.D., Pasture and Fodder Crops Investigations Project, Technical Progress Report No. 3, Results of Tests on Dryland Forage Crops at Homand Station, 1960-1966. A Joint Project of Min. of Agr. and Nat. Res. and FAO. Tehran. Sept. 1967.

_____, Final Report on Range Management and Livestock Husbandry in the Pilot Zone. FAO/UNDP. Tehran. 1971.

Lauritzen, C.W., and Arnold A. Thayer, Rain Traps for Intercepting and Storing Water for Livestock. Agr. Inf. Bul. 307. Agr. Res. Serv., U.S.D.A. (in cooperation with Utah Agr. Exp. Sta.). Washington, D.C. Aug. 1966.

LeBaron, Allen D., Long Term Projections of Supply and Demand for Selected Agricultural Products in Iran. Utah State Univ., Logan. June 1970.

_____, "Projecting Iranian Agricultural Demand and Supply." Iranian Jour. of Agr. Res., Vol. 2, No. 1., Pahlavi Univ., Shiraz. Oct. 1973.

Leubs, R.E., Summer Fallow in the Southwest. Agr. Res. Serv., U.S.D.A. Conserv. Res. Rpt. 17. 1974. pp. 136-148.

Lewis, W. Arthur, Development Planning. Unwin Univ. Books. London. 1966.

Malekpour, Behrooz, Iran's Rangelands Report at CENTO Workshop on Range Condition Classification. Tehran. Aug. 18-23, 1973.

Mansour H. and M. Rahim Salehi, Poultry and Egg Marketing Study. Cen. for Agr. Mktg. Dev. Tehran. 1972.

McDowell, R.E., Review of Animal Production Research. FAO Tech. Rpt. 1, Tehran. 1972.

McGowan, G.P. and Associates, Gorgan Livestock Project. Vols. 1 and 2. Prepared for the Imperial Government of Iran. Tehran. June 1972.

_____, Karaj Watershed Management Project. Vols. 1-11. Tehran. Feb. 1974.

McArthur, J.A.B., Range and Pasture Management. FAO/UNDP. Tehran. 1953.

Mehren, George L., Agribusiness Opportunities in Iran. The Agribusiness Council, Inc. New York. June 1970.

Ministry of Agriculture, Report on the Conferences on Agricultural Price Data for Research and Decision-Making. Div. of Agr. Econ. Bangkok. 1969.

Ministry of Agriculture, Principal Aspects of Agricultural Planning in Israel. Agr. and Settlement Planning and Dev. Center. Hakirya, Tel Aviv. 1971.

Ministry of Agriculture and Natural Resources, Agribusiness Opportunities in Iran. Tehran. 1974.

_____, Agricultural Development Fund of Iran. Tehran. No date.

_____, Preliminary Report of Iran Agricultural Plans and Agricultural Policies During Next 25 Years. Planning Bur. Tehran. No date.

Mohammad Reza Shah Pahlavi, Mission for My Country. McGraw-Hill Book Co. Inc., New York. 1961.

Myers, Lloyd E., "Recent Advances in Water Harvesting." Jour. of Soil and Water Conserv. Vol. 22, No. 3. May-June 1967.

_____, and Gary W. Frasier, "Asphalt-Fiberglass for Precipitation Catchments." Jour. of Range Management. Vol. 27, No. 1. Jan. 1974.

Naderi, Nader Afshar, The Settlement of Nomads and Its Social and Economic Implications. Inst. for Soc. Studies and Res. Tehran Univ. Tehran. Oct. 1971.

O'Donovan, P.B., Feed Resources for Livestock in Iran. Tech. Rpt. 8. An. Husb. Res. Inst. Tehran. 1971.

Otterman, Joseph, "Baring High-Albedo Soils by Overgrazing: A Hypothesized Desertification Mechanism." Science, Vol. 186, pp. 531-3. Nov. 8, 1974.

Overseas Technical Cooperation Agency, Report on Preliminary Survey for Agricultural Development of Sistan Plain, Iran. Tokyo. Dec. 1973.

Pabot, Henri, Report to the Government of Iran on Pasture Development and Range Improvement through Botanical and Ecological Studies. Rpt. TA2311. FAO/UNDP. Rome. 1967.

Papanek, F., Translation of Forests & Pastures Protection Law of Iran, As Enacted 21 August 1967 and Amended 15 April 1969, with Executive Regulations Issued 25 February 1968. Caspian Forests Development Project, FAO Mission. Tehran. Oct. 1969.

Paymani, Bahram, and Abdulrasool Tarifi, Rehabilitation of Denuded Rangelands Through Research on Season, Method, Depth, and Planting Rate of Dryland Forage Species. Res. Inst. of For. and Rangelands, MANR. Tehran. 1972.

Payne, William, Livestock in Iran. Consultant's Report to Hunting and Bookers Ltd. Tehran. Oct. 1974. Unpublished.

Pearse, C. Kenneth, Pasture and Fodder Crop Investigations-Iran-A Range, Pasture, and Fodder Crop Program For Iran-A Problem Analysis and Working Plan. FAO/UNDP. Tehran. June 1968.

_____, "Qanats in the Old World; Horizontal Wells in the New," Jour. of Range Management, Vol. 26, No. 5. Sept. 1973.

Pechanec, Joseph F., IESC Project No. 5187, Organization and Program Review-Research Institute of Forests and Rangelands. Int. Exec. Serv. Corps, U.S.A. Tehran. Oct. 1973. Unpublished.

Peterson, Dean F. and others, More Water for Arid Lands: Promising Techniques and Research Opportunities. Nat. Acad. of Sci. Report of an ad hoc Committee of the National Research Council. 1971.

Plummer, Perry A. and others, Seeding Rangeland in Utah, Nevada, Southern Idaho, and Western Wyoming. Agr. Handbook 71. U.S.D.A. Washington, D.C. 1955.

Plan and Budget Organization, Fourth National Development Plan - 1968-72. Tehran. 1968.

_____, Coordinated National Food and Nutrition Policy and Plans. Div. of Health and Social Welfare. Tehran. May 1972. (prelim. draft).

_____, Battelle Regional Development Project: Executive Summary. Vol. 1. Battelle Mem. Inst. Tehran. Oct. 11, 1972.

_____, Unified Report-Regional Development Plan Frame-Work. Battelle Mem. Inst. Tehran. October 11, 1972.

_____, Statistics of Iran. Iran Stat. Cntr. Tehran. 1973.

_____, Economic Development Project for Kermanshahan-Vol. 1: Present Status and Criteria for Future Development-Vol. 11: Implementation of Economic Development Program. ABDAY Consulting Engineers. Tehran. (No date, but about 1972).

_____, Summary of the Fifth National Development Plan 1973-78. Tehran. June 1973.

Pohoryles, Samuel, The Agriculture in Israel: A Model of Economic Planning. Agriculture and Settlement Planning and Development Center, Min. of Agr. Tel Aviv. 1974.

Preston, T.R. Intensification of Mutton and Beef Production with Particular Reference to the Role of Feedlot Fattening. FAO, Tech. Rpt. 2. Tehran. 1972.

"Range Forage Yield Estimates." Rangeman's News. Aug. 1974. P. 8.

Reda, Khalil, Programming an Agricultural Development Plan. FAO/UNDP. Tehran. Nov. 1971.

Sayadi, Mohammad, Recommended Forage Species and Planting Methods for Range Improvement in Semi-Arid Zones of Iran. Res. Inst. of For. and Rangelands, MANR. Tehran. 1973.

Schickele, Rainer, Motives and Criteria for National Planning. Rehovoth Conference on Comprehensive Planning of Agriculture in Developing Countries. Rehovoth, Israel. Aug. 1963.

- Semple, A. T., Grassland Improvement. Leonard Hill Books. 1970.
- Seraj, Nowzar, Improvement in Utilization of Iran's Kholeshkuh Range by Management Planning. Grad. School, Univ. of Idaho. Moscow. May 1973.
- Shaidae, G., Conservation, Rehabilitation, and Improvement of Rangelands in Iran. Min. of Agr. and Nat. Res. Tehran. About Feb. 1974.
- _____, and F. Niknam, Resources Conservation in Iran. Min. of Agr. and Nat. Res. Tehran. About June 1974.
- _____, Management of Natural Resources in the Arid and Semi-Arid Regions of Iran. Min. of Agr. and Nat. Res. Tehran. 1975.
- Stakman, E. C., Richard Bradfield and Paul C. Managelsdorf, Campaigns Against Hunger. Belknap Press. 1967.
- Stobie, W. D. and others, Tehran Livestock Market Survey: Interim Report (6 Months): Sheep and Goats. FAO/UNDP. Cen. for Agr. Mktg. Dev. Tehran. 1972.
- _____, First Steps in Classification and Grading of Sheep and Sheep Meat in Iran. FAO/UNDP. Tehran. Dec. 1974.
- Tadmor, Naphtali H., Ezra Eyal and Roger W. Benjamin, "Plant and Sheep Production on Summer Annual Grassland in Israel." Jour. Range Mgt: 1974. 27: 427-432.
- Telisseh Company, Feasibility of Dairy Farm Development on Tabag Deh and Khavandun Areas, Keka-Mazandaran Province. Agribusiness Management, Inc. Fresno, Calif. Dec. 1973.
- U.S. Agency for International Development, "AID Helps Morocco Improve Rangelands, Lamb Production." Front Lines, Vol. 12, No. 16. June 13, 1974.
- U.S. Department of Agriculture, Agricultural Research Service, Plant Morphogenesis as the Basis for Scientific Management of Range Resources: Proceedings of the Workshop of the United States-Australia Rangelands Panel, Berkeley, Calif., March 29-April 5, 1971. Misc. Pub. 1271. Jan. 1974.
- _____, Economic Research Service, Iran Agricultural Production and Trade. Apr. 1974.
- _____, Forest Service, Hauling Water to Sheep on Western Ranges. Leaflet 423. Jan. 1958.
- _____, Non-structural Range Improvement Handbook, Intermountain Region. Handbook 2209.23, Ogden, Utah. Aug. 1959, with subsequent amendments.
- _____, Range Research Methods - A Symposium. Misc. Publ. 940, Dec. 1963.
- _____, Range Environmental Analysis Handbook, Intermountain Region. Handbook 2209.21, Ogden, Utah. July 1964, with subsequent amendments.

- _____, Suggested Guide for Weed Control. Agr. Handbook 332. July 1967.
- _____, Range Management. Forest Service Manual, Title 2200. June 1968, With subsequent amendments.
- _____, Structural Range Improvement Handbook, Intermountain Region. Handbook 2209.22. Ogden, Utah. May 1969.
- _____, Principles of Rest-Rotation Grazing and Multiple-Use Land Management. Training Text 4(2200). Sept. 1970.
- _____, Wildland Shrubs - Their Biology and Utilization - An International Symposium, Utah State University, Logan, Utah, July 1971, Intermountain Forest and Range Experiment Station. Gen. Tech. Rpt. INT-1. Ogden, Utah. Aug. 1972.
- _____, Range Management Practices: Investment Costs, 1970. Agr. Handbook 435. Oct. 1972.
- _____, Structural Range Improvement Handbook, South-Western Region. Handbook 2209.22. Albuquerque, New Mex. Jan. 1972.
- _____, The Nation's Range Resources - A Forest-Range Environmental Study. Forest Resources Rpt. 19. Dec. 1972.
- U.S. Department of Interior, Water Development - Range Improvements in Nevada for Wildlife, Livestock, and Human Use. Bur. of Land Mgt. Reno, Nev. Mar. 1964.
- _____, Project Skywater - An Introduction to "Rivers in the Sky." Dec. 1973.
- U.S. Department of State, Technical Cooperation with Iran: A Case Study of Opportunities and Policy Implications for the United States. AID. 1972.
- Utah State University, Development and Use of Foothill Ranges in Utah. Bulletin No. 461, Agr. Exp. Sta., Logan. Sept. 1966.
- Van der Wal, O.A. and A.H. Shamsi, The Production of Fodder Maize and Maize Silage in the Tehran Area. Tech. Rpt. 10. FAO/UNDP. Tehran. Mar. 1972.
- _____, Irrigated Fodder Crops. Tech. Rpt. 14. FAO/UNDP. Tehran. Apr. 1972.
- Wade, Nicholas, "Sahelian Drought: No Victory for Western Aid." Science, Vol. 185, pp. 234-6. July 19, 1974.
- Ward, Gerald M., "The Case for Increased Animal Production in Iran to Improve Human Diets and Increase Rural Employment." Iranian Jour. of Agr. Res., Vol. 1, No. 1, Pahlavi University, Shiraz. Oct. 1971.

Watersaver Company, Inc., Watersaver Rain Traps. Bul. RT-70. Denver, Colo. Apr. 1, 1973.

Waterston, Albert, Development Planning: Lessons of Experience. John Hopkins Press. Baltimore. 1965.

Welchert, W.T. and Barry N. Freeman, "Hortizontal Wells." Jour. of Range Mgt., Vol. 26, No. 4. Sept. 1973.

Welle, A., Milk Marketing and Consumption in Iran. FAO/UNDP. Tehran. July 1970.

Wittwer, S.H., "Maximum Production Capacity of Food Crops," Bio Science, Vol. 24, No. 4. Washington, D.C. Apr. 1974, pp. 216-24.

Workman, John P. and Thomas M. Quigley, "Economics of Fertilizer Application on Range and Meadow Sites in Utah." Jour. of Range Mgt., Vol. 27, No. 5. Sept. 1974.

ANNEX I

DETERIORATION OF GRAZING LAND IN IRAN

Assuming overgrazing on Iran's rangelands to be a fact, we move now to the problem of how much the rangelands are overgrazed. This is a difficult problem because the basic information needed to reach a clear-cut decision is not available. Any conclusions reached will be based, in part at least, on assumptions. The conclusions reached therefore, will be no better than the assumptions on which they are based.

The following assumptions will be used throughout this analysis:

- (1) 100 million hectares of rangeland.
- (2) Numbers of sheep-units of sheep and goats x 2 equals the sheep units of livestock in Iran.
- (3) 430 and 620 kg. TDN/sheep-unit/year represent low and high levels of nutrition, respectively. These correspond to flocks 1 and 4 of Table 1 appearing in Annex II. TDN x 2 = dry matter from grazing.

Some other assumptions will be necessary, three of which require explanation.

- (4) 50 percent use of current year's growth.

We are not aware that proper use factors have been established for Iran's rangelands. However, one widely distributed species, Artemisia herba-alba, has a proper use factor of 25 percent. This is a species with low palatability. Utilizing it 25 percent means that more palatable associated species will be used much more. There is considerable evidence, world-wide, that on arid rangeland browse as a class will tolerate a higher percentage of use than will grass. In the western United States, although subject to wide departures, the average grass range has a proper use factor of 50 percent. We believe browse is relatively more important on Iranian ranges, and we will therefore assume 50 percent is proper use under Iran's more arid conditions.

- (5) Potential productivity 450 kg dry matter/hectare/year.

Present rangelands in the western United States produce approximately 450 kg dry matter/ha/yr. The average precipitation is 300 mm. (in Iran, it is 228 mm). U.S. ranges have not been so badly depleted as Iranian ranges, though they were once overgrazed and have not yet fully recovered. The average temperature in the western United States is lower than in Iran, and rainfall is generally better distributed. Comparing the western United States with Iran, it does not appear likely that Iran's rangelands

have the potential to average over 400 to 450 kg dry matter/ha/yr. In this analysis we will use 450, but it may be on the high side.

(6) 1970 productivity, 231.8 kg/ha/yr.

In 1970, the Range Bureau classified the rangelands of Iran and estimated their productivity. Their data have been used to construct Figure 1, and the average yield per hectare turns out to be 231.8 kg. Note from (5) above, that if we accept (5) and (6) as reasonably accurate, we would have to accept 50 percent deterioration as the first conclusion. But we must include other considerations before we prepare to reach conclusions.

Sheep and Goats in Iran

Statistics on livestock numbers in Iran are incomplete, and there is little to inspire confidence in them. Sheep and goat numbers, converted to sheep-units (one goat = 0.7 sheep) are presented in Figure 2. If we accept these fragmentary data as reasonably reliable we can conclude that up to about 1950, and possibly as late as 1956, there was either a rather gradual build-up of numbers or, from 1934 to as late as possibly 1956 there was essentially no change in numbers. The data suggest a rather rapid build-up from 1932 to 1934 and again from somewhere between 1950-1956 to 1962, after which numbers have levelled off. Readers can make their own interpretations from the data in Figure 2, but it appears reasonably clear that from 1931 to the present there has been an approximate tripling of sheep and goats in Iran.

Statistics on other classes of livestock are even less complete (therefore assumption 2, above).

However much agreement there may be that rangelands are overstocked, there is not agreement on the extent of overstocking. Current estimates range from 2 to 12 times. We provide the following analysis of this problem:

(1) NUMBERS THEN AND NOW

We assume that in 1931 grazing was not harmful to most of the range. The following quote from a FAO report of 1969, generally attributed to Kernick, offers some support for this assumption:

"over most of the area a stable ecological balance was maintained. Palatable and nutritious grasses and other plants provided ample sustenance for the herds, and because they were not continuously overgrazed these desirable forage species continued to flourish and reproduce themselves. Evidence indicates that until recent times the feed requirements of man's animals were generally well within the forage producing ability of the land.

Figure 1. Estimated production of 100 million hectares of rangeland. 1970. Range Bureau.
Average production 231.8 kg dry matter/ha.

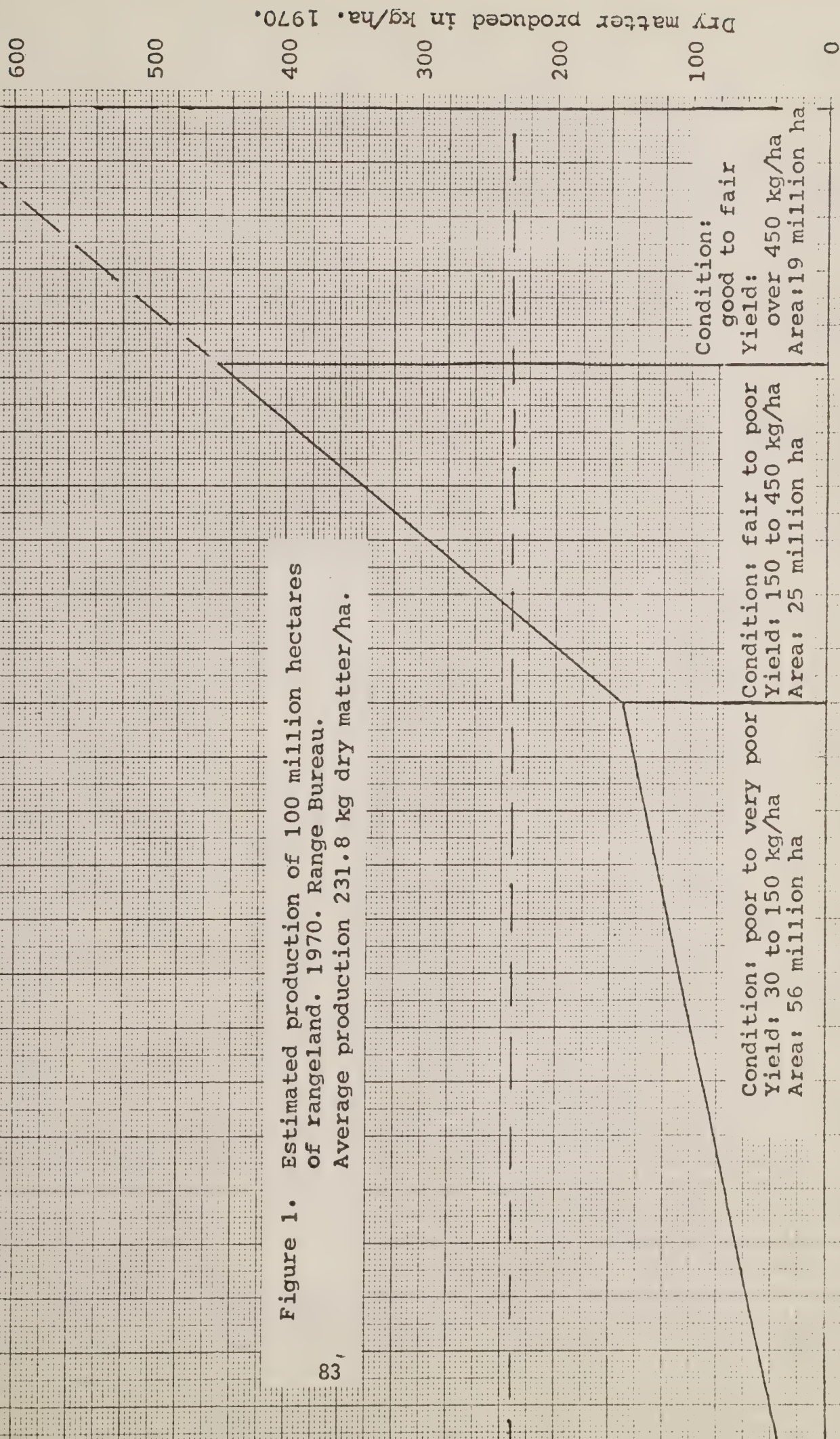
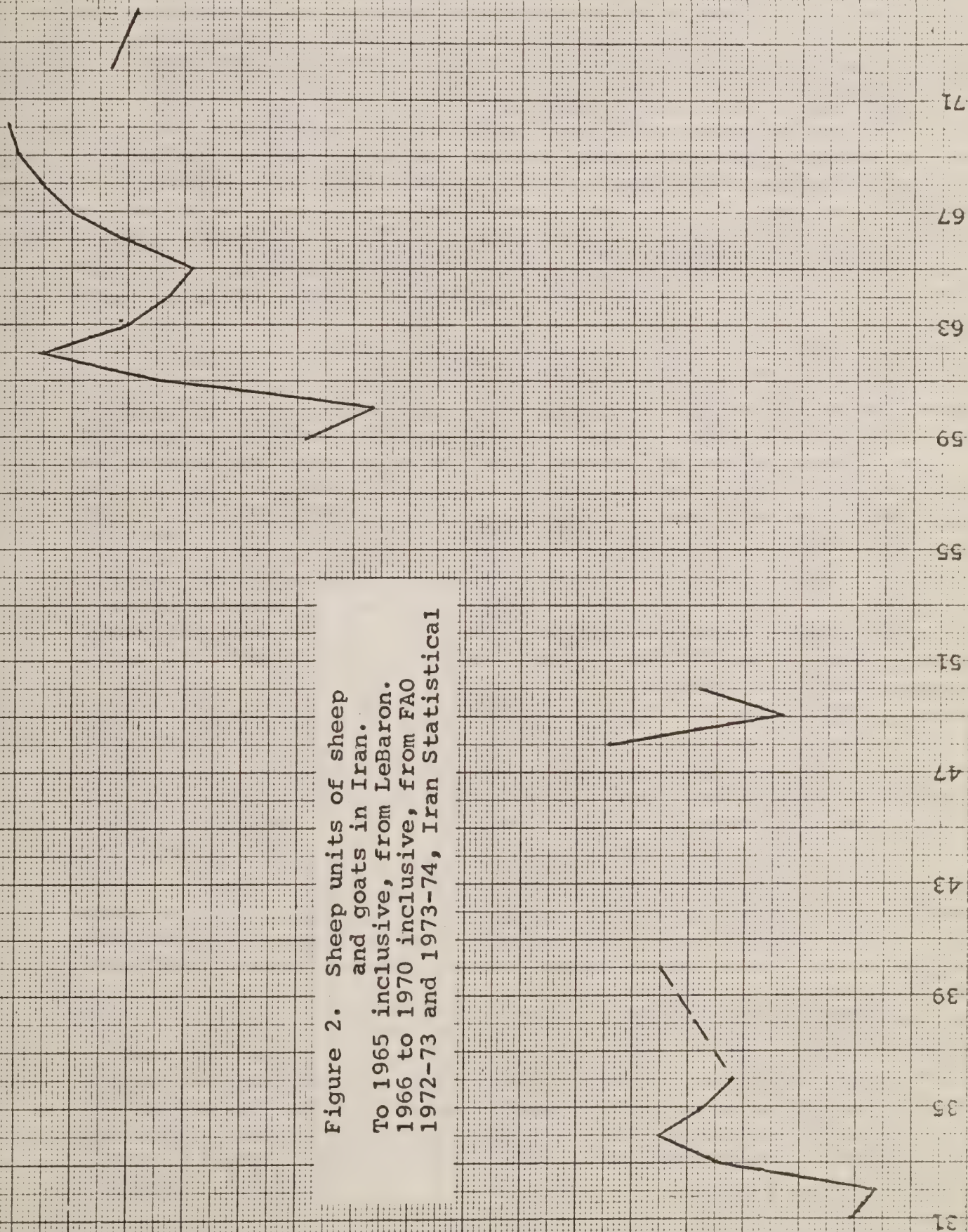


Figure 2. Sheep units of sheep and goats in Iran. To 1965 inclusive, from LeBaron. 1966 to 1970 inclusive, from FAO 1972-73 and 1973-74, Iran Statistical

Sheep units of sheep and goats. Millions. (1 goat = .7 sheep)



Probably within the last century, with a stabilization of human populations, the numbers of domestic livestock began to build up rapidly and the grazing pressure on native ranges increased. The numbers of grazing animals soon reached the point where in many places the better forage plants were overgrazed and the ecological balance was upset. This buildup of livestock numbers and the pressure on the land has greatly accelerated during the past two decades. It is estimated that the numbers of sheep, goats and other domestic livestock now grazing Iran's ranges amounts to at least five times the forage producing capacity."

Assuming the rangelands were not overstocked in 1931 we have constructed Table 1, introducing into it the assumptions of 25 and 50 percent range deterioration. These assumptions lead directly to the conclusion of four to six times overstocking.

If we take the less certain position that from 1934 to as late as 1950 or 1956 the range was not overstocked (table 2) we can reach the conclusion that with 33 or 50 percent range deterioration (again assumed) we have three or four times proper stocking, respectively. In general, Kernick's statement supports Tables 1 and 2. He states that the forage needs were "well within the forage producing ability of the land," and that this condition changed when population built up, and livestock numbers with it. Figure 3 presents the population increase in Iran from 1906 to 1973. Between 1906 and 1921, population changed little, but by 1931, it reached approximately 12 million. If pressure on the range began with buildup of population (and presumably sheep and goat numbers) starting in 1921, it is a reasonable assumption that overgrazing was first obvious near the villages. In fact, rangelands near the villages probably were overgrazed almost from the beginning of the villages, because it was most convenient to graze near home. Overgrazing therefore would have spread from the village grazing lands to ranges more remote. The Range Bureau classification (figure 1), having 19 million hectares of range in good to fair condition, indicates that overgrazing had not yet spread to all the ranges in the country. Twenty years earlier, at mid-century, a much larger area of the range would undoubtedly have rated good to fair. This line of reasoning lends support to the belief that as recently as 1950 or even to 1956, a large portion of Iran's rangeland was not particularly overstocked. From another angle, the very large buildup in numbers which ended in 1962 with about 42 million sheep units of sheep and goats, could hardly be explained if range abuse was general at mid century.

The relationships shown in Tables 1 and 2 do not make any allowance for differences in the level of nutrition now and in earlier periods. If the range then was not overstocked, the animals on it may have been better nourished than they are now. Tables 1 and 2 also assume that during both periods the range supplied the same percentage of the total feed needs of Iranian livestock. The conclusions of Tables 1 and 2 are thus accepted with the realization that several unproven assumptions are involved.

Figure 3. Population of Iran, 1906 to 1973, millions.

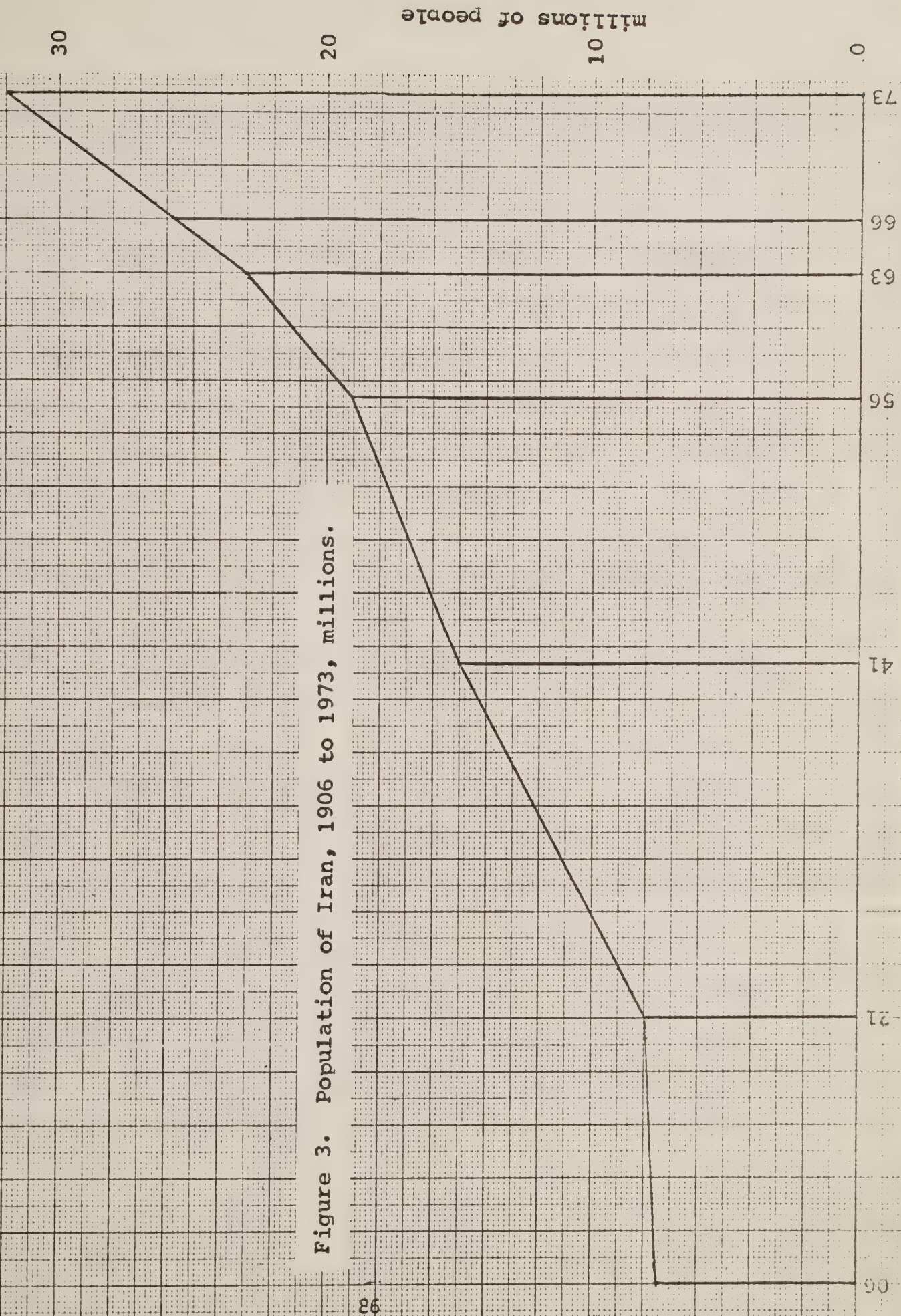


Table 1 -- Relationship between the rate of stocking, assumed proper stocking, calculated overstocking, and percent deterioration, base 1931.

Year	Rate of stocking (1)	Assumed deterioration (2)	Assumed proper stocking (3)	Calculated overstocking (1/3)
1931	14 million	none	14 million	none
1970	42 "	"	14 "	3 times
1970	42 "	25 %	10.5 "	4 "
1970	42 "	50 %	7 "	6 "

Table 2 -- Relationship between the rate of stocking, assumed proper stocking, calculated overstocking, and percent deterioration, base 1934 to 1950-56

Year	Rate of stocking (1)	Assumed deterioration (2)	Assumed proper stocking (3)	Calculated overstocking (1/3)
1934-56	21 million	none	21 million	none
1970	42 "	"	21 "	2 times
1970	42 "	33 %	14 "	3 "
1970	42 "	50 %	10.5 "	4 "

(2) FEED REQUIREMENT NOW

Another approach is to calculate the amount of feed the range would have to contribute. This has been done for the low level of nutrition and assuming 84 million sheep units of livestock in Iran; it is presented in Figure 4. Figure 4 indicates that if the range has a productive capacity of 231.8 kg/ha, then at 50 percent use of current growth less than 20 percent of the total feed need could be supplied. Over 60 percent utilization would be required to supply 20 percent of the feed need. If the range was to provide nearly 70 percent (Shaidee, 1973 or 74), it would require 70 percent utilization with the range capable of producing 700 kg/ha/yr. It appears obvious from these figures that the rangelands of Iran do not contribute 70 percent of the feed requirement of Iranian livestock, unless grazing is at such an intense level that all of the current year's growth and some of the older growth is grazed. Since this intensity of use would lead to very rapid range deterioration, the true level is probably at some intermediate position.

(3) FEED REQUIREMENT IN 1931

If we assume 28 million sheep units of livestock in Iran in 1931, and that much of the range was still in good condition, most of the animals feeding on the range could have been well nourished. We can calculate that at 50 percent use, the range would provide about 65 percent of the total feed need, assuming the range was producing 450 kg/ha. If we assume that general overgrazing already had set in, averaging 70 percent utilization, our range could provide 90 percent of the total feed need, still on a high level. But if our estimate of proper use is reasonably correct, 70 percent use probably would have led to rather rapid range deterioration, even before livestock numbers tripled.

Therefore, unless we decide that in 1931 the range was capable of producing more than 450 kg/ha, we must conclude that the range probably did not contribute more than 70 percent of the total feed need, or that, if it did, the level of nutrition was lower. This latter is a likely assumption, because fat, well nourished animals have never appeared to be a high-priority goal in Iran. If we place the same animals on the low level of nutrition, our range, producing 450 kg/ha, would supply about 95 percent of the total feed need at 50 percent utilization (figure 5). This could suggest that in 1931, while overgrazing may have been general around the villages, it was still not occurring on the bulk of the nation's rangelands. By this interpretation, the bulk of the range could remain in good condition until more recent times.

(4) FEED REQUIREMENT 1934 to 1950-56

During this approximate 20-year period sheep and goat numbers, as expressed in sheep units, increased little if any, if we can place confidence in the data for 1948-1950 (figure 2). The data

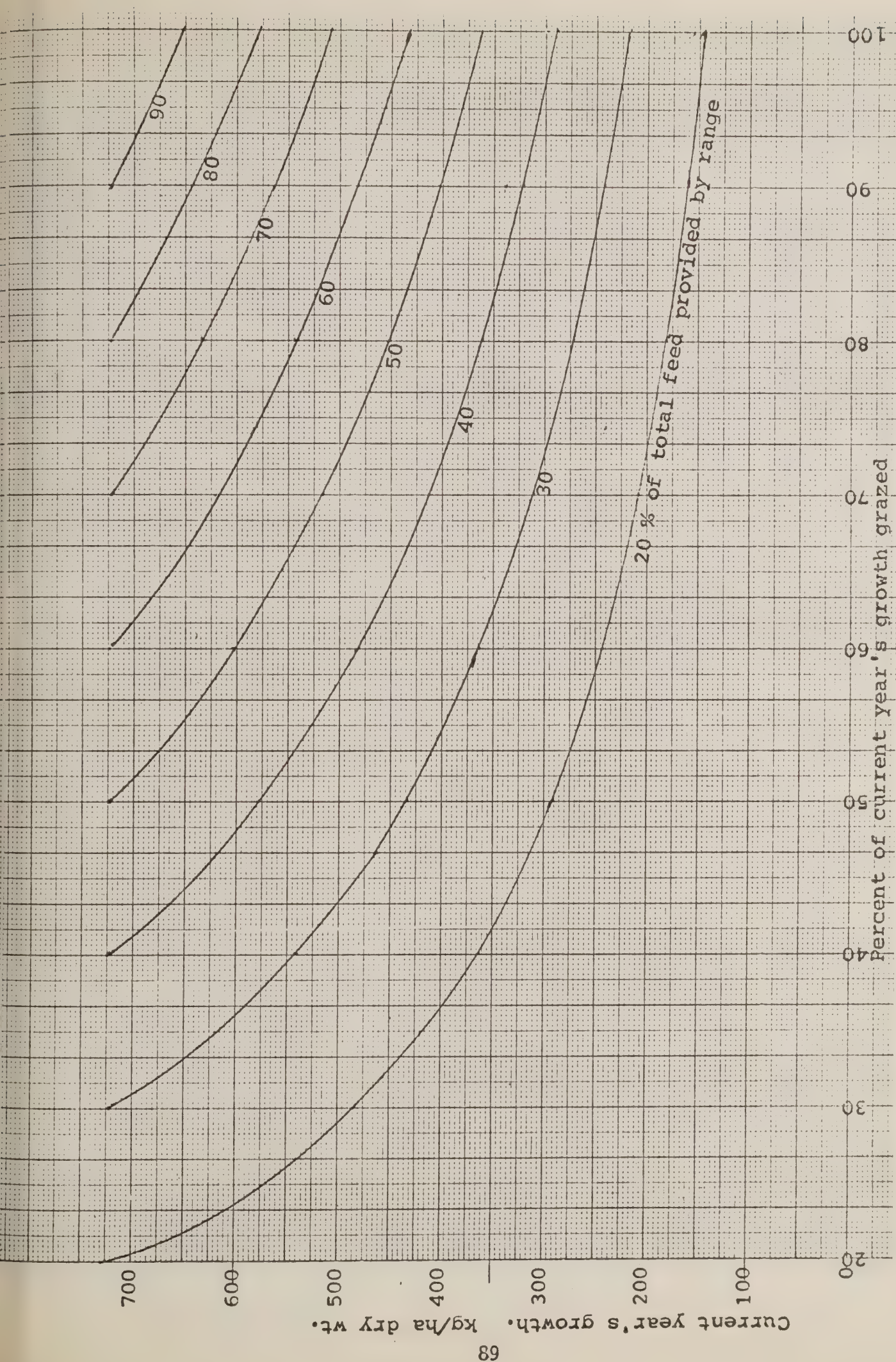


Figure 4. Total production required per average hectare of range to provide the indicated percentage of the total feed need at any specified percentage of use of the current year's growth.
Assumptions: 84 million sheep units, 100 million hectares range, 430 kg TDN/sheep unit/yr. 1970. Flock 1. (Dry matter = TDN x 2)

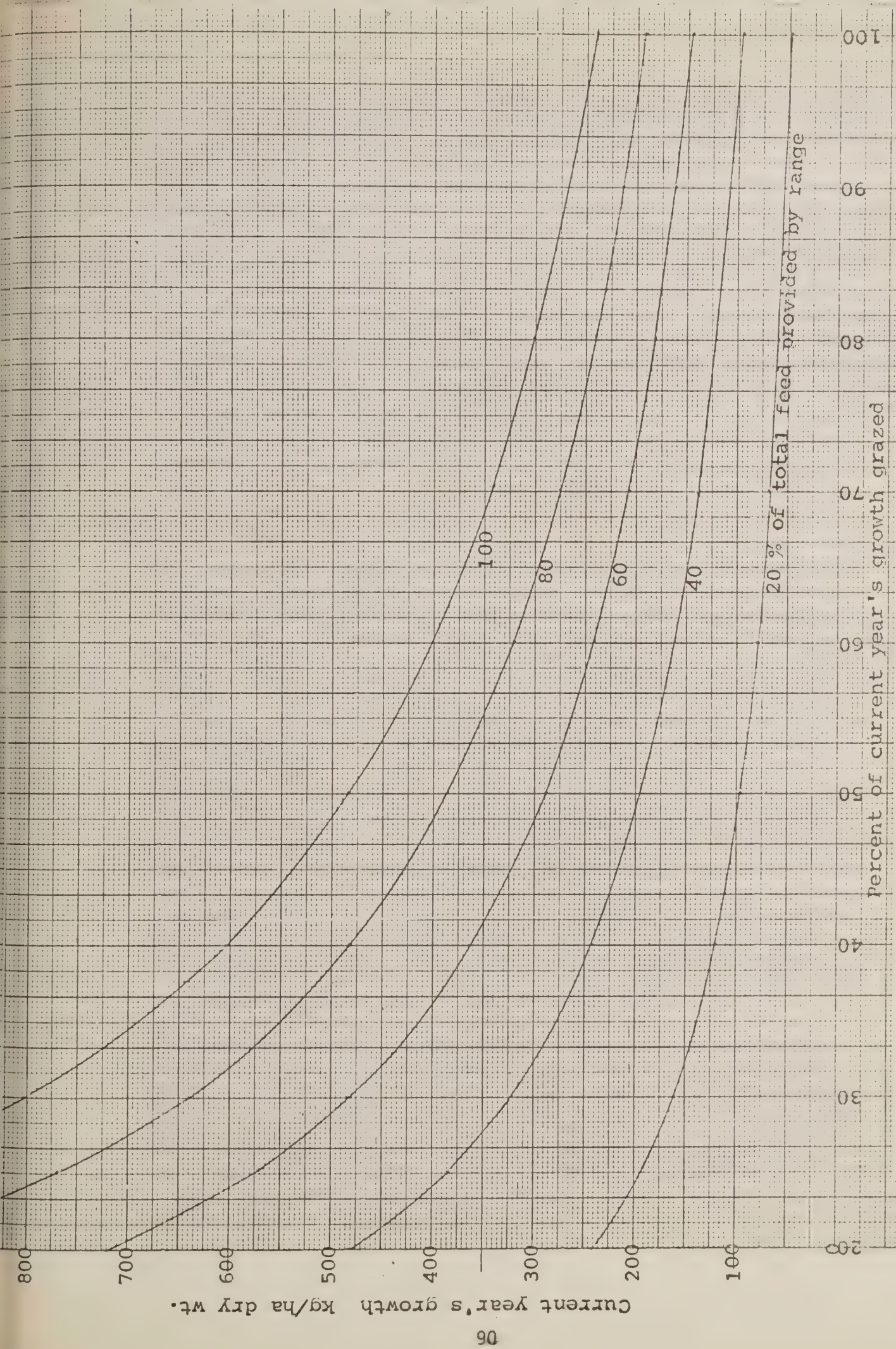


Figure 5. Total production required per average hectare of range to provide the indicated percentage of the total feed need at any specified percentage of use of the current year's growth. Assumptions: 28 million sheep units, 100 million hectares range, 430 kg TDN/sheep unit/yr. 1931. Flock 1. (Dry matter = TDN x 2)

indicate a sudden 50 percent increase in numbers from 1932 to 1934, but little if any change thereafter until the most recent increase in numbers which began sometime between 1950 and 1956.

We can calculate the feed needs of the approximately 42 million sheep units (1934 to 1950-56). At the lower level of nutrition, the range would provide about 62 percent of the feed need if it was capable of producing 450 kg/ha. and was used at 50 percent of current year's growth. It would provide 70 percent if used at about 57 percent. During this period, population increased about 50 percent. Cultivated land probably had a similar increase. The crop residues and byproducts from cultivated agriculture probably became increasingly important to livestock during this period, although increased cropland was at the expense of range. As recently as 1971, O'Donovan estimated livestock feed other than grazing to total only about 3.9 million tons TDN. This is only about 11 percent of the total feed need, which would imply that grazing was providing 89 percent. We must conclude that O'Donovan did not account for all the non-grazing resources.

DISCUSSION

The degree of overstocking of Iran's rangelands would not be so difficult a problem if we could firmly identify a time when the rangelands were fully and properly stocked. But there never was such a time. No doubt at some time stocking adjacent to each village was full and proper, but then the more remote ranges were probably understocked. As numbers increased, overgrazing spread out from the villages to more distant lands. Overgrazing is a product of the villages. The nomads never have been numerous enough, nor have they owned enough animals, to have created the problem except on the migratory routes. It is well known that range forage plants can withstand rather heavy use if they are given adequate periods of rest. The nomads may have provided this rest before the latest build-up of numbers, if we believe that there was ample forage up to that time. Ample forage meant that the nomads had a choice where they grazed. They naturally chose the best range each year. This would have led to alternating each year between at least two areas, the range grazed last year not being as good as the range rested last year. Under alternate year use the range could withstand rather heavy grazing. When numbers doubled between 1950-56 and 1962, no choice was left; all the range was needed each year; the use became too heavy, and general deterioration set in.

The migratory trails and nearest to village grazing lands may have been overgrazed for centuries, but only with a buildup of numbers that required more than all the grazing lands could provide did general overgrazing set in. Even in 1970, according to Range Bureau survey (figure 1) overgrazing had not yet been distributed throughout Iran because 19 million hectares were judged by them to be in good to fair condition while 56 million hectares were in poor to very poor condition. These latter, no doubt, included the village grazing lands and migratory trails.

To understand the present situation it seems essential to accept as fact that overgrazing was still restricted and not general until sometime after 1950. The basic stimulus to the shepherd to increase his flock had to be that "a little farther out" there was good range. From Figure 5, it is clear that in 1931 the range could provide nearly all the needs of Iranian livestock. The same range, if largely undamaged, could provide 62 percent of the feed needs of the 1934 to 1950-56 period, at 50 percent use. The doubling of numbers from the 1950's to 1962 must have been triggered by the belief on the part of the shepherds that somewhere "a little farther out" there were still good pastures. And the abrupt leveling off (if not some decline) can be viewed as evidence that overstocking has become general, and with it general range deterioration. If general deterioration had set in earlier, stockmen would not have expanded their flocks to present numbers, or, the range would not have survived to this time. If we refer to Table 2, which assumes no range deterioration in the 1934 to 1950-56 period, or only the very beginning of it, we can allow 50 percent deterioration by 1970 and we have four times proper stocking on the range. We also are in agreement with our estimate of the maximum productive capacity of the range in relation to the 1970 production estimated by the Range Bureau. We can also harmonize calculated production, since Figure 4 indicated that about 15 percent of the feed need would be provided at 50 percent use. This would be 60 percent of the need of one-fourth the numbers. If we assume 75 percent use, because we know the ranges are deteriorating, the range would be providing about 23 percent of the total need. Since we have twice the 1934 to 1950-56 numbers, and approximately 50 percent deterioration, we arrive at four times proper stocking, in 1970 ($84/42 \times 450/231.8 = \text{approx. } 4$). And since we recognize range deterioration as a fact, by 1975 we would have to expect stocking to be over four times proper, in the absence of adequate corrective measures.

If we accept the situation in 1970 as four times proper stocking, we must accept with it that the range is not providing more than about 23 percent of the total feed need, and that if this is not approximately right some of the basic assumptions on which this analysis is founded are grossly out of line. The effect of minor adjustments would not be adequate. For example, if we assume that production of the range was 25 percent higher than the Range Bureau estimate (or 290 kg/ha), that the nutritional requirement used was 25 percent too high (or 344 rather than 430), that grazing use was 75 percent (rather than 50 percent), and that sheep units were 10 percent too high (or 75.6 rather than 84 million), the range would provide just over 40 percent of the total need.

We must also believe that other feed sources are substantially greater than estimated by O'Donovan.

The calculated need is believed to be a more reliable figure than present estimates of feed resources. Range forage resources may or may not be more accurately evaluated than all other sources of feed. All the statistics involved in this analysis need to be critically examined.

- (1) the actual area of grazing land
- (2) the actual number of livestock
- (3) the actual TDN requirement of Iranian livestock
- (4) the actual production of the rangelands
- (5) the actual proper, and present, use of all major range types

Only after reliable statistics have been obtained on the above six subjects can a more conclusive analysis be carried out.

A point of view that should be recognized at the earliest possible moment is that the degree of overstocking is progressive on deteriorating range unless either (1) numbers of animals are drastically reduced, or (2) some other relief is provided, such as greatly increased forage production from cropland.

SUMMARY

Rangelands of Iran probably were stocked at an overall proper rate in the early 1930's or as late as the 1950's although there were areas of overgrazing particularly in the vicinity of villages. Since that time livestock numbers (expressed as sheep equivalents) have at least doubled in the country. Ranges have deteriorated seriously during the past one or two decades and by 1970 were estimated to be stocked at approximately four times proper use level. General range deterioration is accelerating, and if unchecked will destroy the range livestock industry of Iran in a few years.

ANNEX II

CRUCIAL FACTORS LIMITING LIVESTOCK PRODUCTION IN IRAN

Two basic factors limit Iran's livestock production. First, the amount of productive cropland is not sufficient to provide adequate production of feed crops while still providing wheat, rice, and other crops for direct human consumption as well as production of fiber and export crops. Second, abusive overgrazing has reduced the production capacity of the range and pasture lands until they provide only a maintenance ration in most years with disastrous starvation and animal death losses in years with below normal rainfall.

While there are many secondary limiting factors, it is worthwhile to examine nutritional requirements for production of carcass lamb and mutton under different management programs and at different levels of production. For this purpose it is convenient to use total digestible nutrients (TDN) as a basis for discussion and comparison.

Animals require nutrients for maintenance of essential bodily functions, for growth, for production of young (gestation), for lactation, and for fattening. With inadequate feed supplies, animals use nutrients preferentially in roughly the order given above. Maintenance (or survival) has top priority with the production-related functions failing or being greatly reduced.

Under specified environmental conditions, maintenance requirements remain constant, or nearly so, regardless of level of production. These requirements represent an unavoidable drain on the livestock production enterprise. The only way to minimize the effect of maintenance on efficiency of production is to keep productivity per animal high so that higher percentages of consumed nutrients are used for production. Everyone realizes the basic validity of this statement but its importance to a nation with feed shortages justifies emphasis and illustration.

For this purpose it is useful to consider some hypothetical sheep populations. For convenience, flocks I to V have been set at 1,000 ewes one year old and older (see table 1).

Flock I has been assumed to have production levels about the same as now exists for Iran's present sheep population. It is assumed that all nutrients are obtained from grazing on ranges, pastures, or crop residues. The following are assumed production levels:

- Ewes lamb first at 2 years of age
- 70 percent of ewes 2 years old or older produce lambs each year
- Lamb birth weight - 4 Kg.
- All lambs are born as singles

15 percent of lambs die before six months of age
5 percent of remaining lambs die before one year of age
5 percent annual death rate in older sheep
All six-year old ewes are sold for slaughter after weaning
their lambs
One ram is maintained per 15 ewes with same age distribution as
ewes
All rams slaughtered at 6 years of age
Average milk production is 75 Kg. per lactation of which 25 Kg.
is taken by the lamb and 50 Kg. milked for human consumption
Live weight of 25 Kg. assumed reached at one year of age
Mature live weight of 40 Kg. assumed reached at two years of
age (genetically this should be 50 Kg. but is held down by
lack of feed)
Lambs not required for flock replacement slaughtered at 18 months
of age
Live weights at slaughter:
6-year old ewes and rams, 40 Kg.
18-month old animals, 37 Kg.
Carcass weights:
6-year old ewes and rams, 18.8 Kg. (45 percent of live weight)
18-month old animals, 19.2 Kg. (52 percent of live weight)

Flock II is same as Flock I except that lambs not required for replace-
ment are weaned at 60 days of age and a live weight of 20 Kg. They are
fed in a feedlot for 136 days with an average daily gain of 125 grams
to a final slaughter weight of 37 Kg. Lamb death losses are assumed to
be 15 percent to two months of age and 2 percent during the feedlot
period.

Flock III is the same as Flock II except slaughter lambs are fed for
240 days to a 50 Kg. slaughter weight.

Flock IV is same as Flock II except that:

Mature weights are 50 Kg.
Carcass weights from 6-year old ewes and rams average 22.5 Kg.
95 percent of ewes 2 years old or over produce lambs
5 percent of lambs die before 60 days of age
2 percent of lambs die between 60 days of age and slaughter or
one year of age
2 percent annual death rate in older sheep

Flock V is same as Flock IV except 30 percent of the ewes lambing
produce twins and each lamb takes 25 Kg. of milk to 60 days of age
leaving less for human consumption than the other flock.

Flock VI with 344 ewes has been added to illustrate requirements for
producing the same carcass weight as Flock I when production per ewe
is at the rate of Flock V.

Nutrient requirements have been estimated from publications of the National Research Council of the United States with extrapolations where necessary. Requirements for milk production have been considered to be the same as for cows.

Maintenance requirements (expressed as kilograms of TDN per day) have been estimated as $.06W^{0.75}$. In this expression W represents live weight in Kilograms. Estimates of maintenance requirements for sheep have varied from about the figure used here down to as little as $.027W^{0.75}$ for animals in close confinement. We believe the figure used here is realistic for Iran in view of the generally sparse grazing with resulting large amount of travel required to secure feed.

Nutrients required for wool production have been ignored. These should be essentially the same for the different flocks so ignoring them should not seriously affect comparisons.

Table 1 summarizes calculations of production, total nutrient (TDN) requirements, requirements per unit of carcass production, and TDN required by source. Several facts from Table 1 are worthy of emphasis:

1. Regardless of level of productivity, maintenance makes up a high percentage of total required nutrients.
2. More rapid growth rates, reduced death losses, or higher reproductive rates all result in a smaller TDN requirement per Kg. of carcass produced. The combined effects of these changes more than doubles production efficiency (compare Flocks I and V).
3. At the productivity level of Flock V a flock of only 344 ewes (Flock VI) would be required to produce as much meat as 1,000 ewes at the productivity level of Flock I. Reducing ewe numbers while maintaining production has obvious implications regarding grazing pressures on ranges. Research is urgently needed to determine whether a productivity level equivalent to Flock V can be attained on restored range in Iran. If found possible it probably would require breeds or crosses of sheep not now used in Iran plus supplemental feeding on range or pasture at certain seasons.
4. Merely finishing lambs in the feedlot will reduce grazing pressure on ranges, pastures, and crop residues by only about 9 percent. Compare TDN required from range, pasture and crop residues for Flock I with that for Flock II. However, a reduction of this amount, together with reduced trampling could be an important component of range improvement.

Table 1--Annual production data by flock 1/

Item	Flocks (1000 ewes 1 year old and older in each)						: 344 ewes		2/
	I	II	III	IV	V	VI	:	VI	
No. slaughtered									
Old ewes and rams	145	145	145	165	165			57	
Lambs or 18-month animals	240	263	263	541	905			311	
Total	394	408	408	706	1070			368	
Carcass wt. produced (M.T.)									
Old ewes and rams	2.6	2.6	2.6	4.1	4.1			1.4	
Lambs or 18-month animals	4.8	5.0	6.8	10.4	17.4			6.0	
Total	7.4	7.6	9.4	14.5	21.5			7.4	
Milk for humans (M.T.)	28.3	28.3	28.3	39.2	29.4			10.1	
TDN requirements (M.T.)									
For gestation	7.1	7.1	7.1	9.9	9.9			3.4	
For lactation	18.3	18.3	18.3	25.3	25.3			8.7	
For growth	62.6	65.9	77.6	107.7	154.3			55.1	
For maintenance	469.3	425.4	453.2	524.0	567.6			195.5	
Total	557.3	514.7	556.2	666.6	757.1			260.4	
Total less TDN for production of milk consumed by humans	542.1	499.5	541.0	645.1	744.5			256.1	
Percent TDN for maintenance	84	83	81	79	75			75	
Kg. TDN per kg. carcass	73.2	65.2	57.2	44.4	34.6			34.6	
TDN by source									
Range, pasture, residues (M.T.)	557.1	470.3	470.3	575.5	604.5			207.9	
Percent of total	100	91	85	86	80			80	
Feedlot (M.T.)	0	44.3	85.8	93.1	152.6			52.5	
Percent of total	0	9	15	14	20			20	

1/ See text for description of flocks

2/ Flock VI represents requirements for producing same carcass weight as Flock I when production per ewe is at same rate as Flock V.

ANNEX III

ALTERNATIVE METHODS FOR ESTABLISHING DAIRIES IN IRAN

It is generally accepted that cattle of the larger exotic dairy breeds, particularly the Holstein, are best suited to commercial dairying in Iran. In addition to being efficient milk producers, these breeds have the ability to grow rapidly and efficiently and to produce carcasses well suited to meet demands for beef in this country. Thus, surplus bull calves and cull heifers and cows would contribute effectively to the beef supply.

Herds of an exotic dairy breed can be established by one of two basic methods. Cows can be imported and herds of pure exotic breeding established immediately. Alternatively, only bulls or semen can be imported and the herd of an exotic breed developed over a period of years by "grading up" from native cows. In this procedure native cows are used to begin the herd. They and all their female offspring and descendants are bred to purebred exotic bulls either naturally or by artificial insemination. The graded up descendants will have 93 3/4 percent of their inheritance from the exotic breed by the fourth generation and 96 7/8 percent by the fifth generation. Animals of these generations can be expected to perform as well as purebreds of the exotic breed.

Advantages and disadvantages of the two methods can be summarized as follows:

Importing exotic cows:

Advantages:

Immediate high levels of milk and beef production.

Disadvantages:

High cost.

Possible health problems.

Require high level of management.

Grading up:

Advantages:

Low initial cost.

Management skills can be developed as herd increases in productivity.

Disadvantages:

Low initial production levels.

Choice of method should depend upon careful study of costs and income expected during the period of time until the graded up herd has reached the same production level as the herd started with purebred imported exotic cows. Other factors including availability of capital and national needs for immediate increases in production of milk and meat may also be important considerations.

As a basis for preliminary judgements on preferred approaches, we calculated the results expected over a 20-year period from herds initially of 1000 cows each, started as follows: (1) 1000 purebred exotic pregnant 2-year old heifers; (2) 1000 exotic native crossbred or F₁ 2-year-old heifers pregnant to exotic bulls; and (3) 1000 2-year-old native heifers pregnant to exotic bulls.

Assumptions for all three herds are as follows:

1. All matings will be to bulls of the exotic breed.
2. The objective will be to build up numbers of cows as rapidly as possible.
Therefore, there will be no culling for low milk production.
3. Female population dynamics:
10 percent of heifers born die before 2 years of age.
10 percent of surviving heifers fail to become pregnant and are slaughtered for meat.
10 percent of cows over 2 years of age leave the herd each year. 2 percent die and 8 percent are culled for failure to become pregnant. These go to slaughter for meat production.
All cows remaining in herd (90 percent) produce calves.
All surviving cows culled after completing lactation in 10th year of age.
4. Bull calves.
8 percent of those born die.
Survivors are all fed intensively for slaughter as meat producers.
5. Milk yields, body weights and Total Digestible Nutrients (TDN) required for milk production are given in Table 1.
6. Information on live weights, carcass weights, and TDN requirements for meat produced in the dairy herds is given in Table 2.
7. In addition, for maintenance and late gestation during a 60 day dry period, requirements will be as follows:

Native	168 Kg. TDN
1st Cross	240 Kg. TDN
2nd Cross	258 Kg. TDN
3rd Cross	300 Kg. TDN
Exotic, 4th Cross and higher	324 Kg. TDN

Table 1 -- Milk yields, body weights, and total digestible nutrients (TDN) required for milk production

Genetic type	: Mature : :body weight:	: Annual Milk Production 1/ :			:TDN required :Per Kg. milk 2/
		Mature: cows	2-year-old: cows	4-year-old: cows	
		Kilograms			
Native	250	1000	800	900	1.05
1st cross	400	2500	2000	2250	.85
2nd cross	485	4000	3200	3600	.75
3rd cross	530	4500	3600	4050	.70
Exotics and 4th and higher crosses	575	5000	4000	4500	.65

1/ Based on age adjustments of 1.25 and 1.11, respectively, for adjusting records of 2- and 3-year old cows to a mature basis.

2/ Estimated from National Research Council tables. Generally, taking both milk production and maintenance into account, the following relations exist:

	Kg. TDN per Kg. milk produced
Milk yield 5 times body weight	.90 to 1.0
" " 10 " " "	.60 to .68
" " 15 " " "	.50 to .56

8. Allowance for feed consumed by animals which die:
 Bull calves, those dying charged with 24 percent as much feed as those slaughtered.
 2-year-old heifers, same as for bull calves
 3-year-old and older cows, those dying charged with same feed as those slaughtered.

9. Prices used:
 Imported exotic heifers, 135,000 rials (\$2,000) per head
 F₁ heifers, 19,200 rials per head. 1/
 Native heifers, 12,000 rials per head 1/
 Milk, 15 rials per Kg.
 Carcasses, 120 rials per Kg.
 Feed, 12 rials per Kg. TDN

1/ Based on 60 rials per Kg. live weight.

At the end of 20 years, each herd would have increased to approximately 24,000 cows of breeding age and, over the 20-year period, would have produced the amounts of milk and meat (carcass weight) and with total digestible nutrient consumption as follows:

	Herds based on:		
	<u>Imported Exotics</u>	<u>F₁'s</u>	<u>Native</u>
Milk (M.T.)	678,654	634,190	577,138
Carcasses (M.T)	21,654	21,142	20,327
TDN consumed (M.T.)	693,897	672,482	638,007

Table 3 gives differences between herds in production and in feed intakes together with estimates of greater net values for the herds with greater production.

At the assumed purchase prices for foundation heifers of the three types, returns for the herd based on imported exotics will be sufficient for only a 7.3 percent return on the greater investment as compared to the F₁ base. Greater return for the exotic over the native base would be 11.1 percent. Both these figures assume that the herds based on grading up F₁'s or natives would be as valuable at the end of 20 years as the one based on an exotic foundation. This would be essentially true for the herd based on F₁'s. Over 94 percent of the cows in this herd would be 4th crosses or higher with the remainder all 3rd crosses. In the case of the herd based on natives this would not be quite true since only 72 percent of the herd would be 4th crosses or higher.

Choice of procedure as regards foundation animals will need to be based on many factors. Variations in price for either imported, F₁ or native heifers could influence decisions.

However, these calculations strongly suggest that long-time returns from using exotics as compared to natives will likely be little if any greater than could be realized from the larger investment if the money were put at interest in situations with much less risk. Beginning with F₁ cows, if they were available in village herds at the prices used, would have definite advantages over either exotics or natives. The potential value of F₁'s strongly indicates the desirability of intensifying present programs of up-grading village cattle.

One point worthy of strong emphasis is that beginning with either F₁'s or natives would be a much lower risk approach. Exotic cows require a high level of management. Crossbreds in the early generations

of grading up will be less affected by poor management. Since managerial expertise is likely to be in short supply in Iran, the grading up procedure provides an opportunity for managers to develop skills while building a highly productive herd with animals in which some inadequacies will likely not have disastrous consequences.

Table 2 -- Carcass weights and TDN required for growth 1/
of animals slaughtered for meat

Genetic type	: : Final : live : weight : (Kg.)	: : : : :	Carcass weight (Kg.)	: : : : :	TDN required per head (Kg.)
<u>Bull calves: (55 percent carcass yield)</u>					
1st cross	340		187		1683
2nd cross	410		226		2034
3rd cross	450		248		2232
Exotics and 4th higher crosses	490		270		2430
<u>Two-year-old heifers: (50 percent carcass yield)</u>					
1st cross	320		160		1440
2nd cross	388		194		1746
3rd cross	424		212		1908
Exotics and 4th higher crosses	460		230		2070
<u>Three-year-old heifers: (50 percent carcass yield)</u>					
Native	225		112		(108) <u>2/</u>
1st cross	360		180	1620	(180) <u>2/</u>
2nd cross	436		218		1962
3rd cross	477		238		2142
Exotics and 4th and higher crosses	518		259		2331
<u>Cows of all older ages: (50 percent carcass yield)</u>					
Native	250		125		(225) <u>2/</u>
1st cross	400		200	1800	(360) <u>2/</u>
2nd cross	485		242		2178
3rd cross	530		265		2385
Exotics and 4th and higher cross	575		288	2592	(522) <u>2/</u>

1/ Estimated at 9 Kg. TDN per Kg. carcass.

2/ Figures in () are for growth of foundation natives, F₁'s and exotics after they came on project at two years of age.

Table 3 -- Cumulative differences in production and nutrient requirements by herds with cost and return estimates for additional investment required by exotic herd for 20-year period.

Item	: : : : : :	Exotic minus F ₁ graded up	: : : : : :	Exotic minus native graded up	: : : : : :	F ₁ graded up minus native graded up
Extra milk (M.T.)		44,464		101,516		57,052
Value at 15 rials/Kg. (1,000 rials)		666,960		1,522,740		855,780
Extra carcass wt. (M.T.)		512		1,327		815
Value at 115 rials/Kg. (1,000 rials)		58,834		152,594		93,760
Total value, extra milk, and carcass (1,000 rials)		725,794		1,675,334		949,540
Extra TDN required (M.T.)		21,415		55,890		34,475
Value @ 12 rials/Kg. (1,000 rials)		256,980		670,680		413,700
Net value, extra milk, and carcass (1,000 rials)		468,814		1,004,654		535,840
Extra initial investment for cows 1/ (1,000 rials)		115,800		123,000		7,200
Annual return on greater investment		7.3 %		11.1%		24.1%

1/ Imported exotic cows \$2,000 135,000 rials per cow
F₁ " @ 60 rials/Kg., 320 Kg., 19,200 rials per cow
native " @ 60 rials/Kg., 200 Kg., 12,000 rials per cow

Table 4 -- Feed consumption (TDN), milk and carcass production by year, based on imported exotics

(all figures in metric tons)

Year	Carcass production			Milk production			Milk production and cow maintenance			TDN consumption for		
	Milk production	Bulls	2-year-old heifers	Cows	Total					Gestation	growth l/	Total
1	4,000	124.2	0	0	124.2	2,924.0	1,142.1	4,066.1				
2	4,050	100.7	10.3	20.7	131.7	2,924.1	1,070.9	3,995.0				
3	5,670	140.9	8.3	20.7	169.9	4,079.2	1,438.0	5,517.2				
4	6,595	163.1	11.7	27.2	202.0	4,747.2	1,769.2	6,516.4				
5	8,083.5	200.1	13.6	38.1	251.8	5,817.4	2,204.1	8,021.5				
6	9,737.5	240.8	16.6	39.3	296.7	7,008.2	2,708.9	9,717.1				
7	11,799	291.6	20.0	49.0	361.5	8,491.7	3,315.8	11,807.5				
8	14,270.5	352.9	24.4	57.0	434.3	10,270.5	4,055.2	14,325.7				
9	17,265.5	426.9	29.4	202.9	659.2	12,425.9	5,164.2	17,590.1				
10	18,956	473.6	35.6	73.3	582.5	13,652.1	5,589.8	19,241.9				
11	23,531	585.6	39.6	91.8	717.0	16,943.7	6,873.0	23,816.7				
12	27,655	686.1	48.8	159.5	894.4	19,908.5	8,788.2	28,696.7				
13	33,155	823.2	57.3	170.3	1,050.8	23,868.0	10,061.6	33,929.6				
14	39,383	977.7	68.5	211.8	1,258.0	28,351.7	12,047.0	40,398.7				
15	46,918.5	1,165.0	81.4	249.7	1,496.1	33,777.8	14,328.1	48,105.9				
16	55,848.5	1,386.4	97.1	299.3	1,782.8	40,205.4	17,074.9	57,280.3				
17	66,466.5	1,650.2	115.5	357.7	2,123.4	47,849.4	20,330.2	68,179.6				
18	78,963.5	1,962.9	137.5	427.2	2,527.6	56,853.4	24,200.5	81,053.9				
19	94,519	2,334.4	163.5	511.4	3,009.3	68,010.4	28,877.7	96,888.1				
20	111,777.5	2,775.6	194.6	610.2	3,580.4	80,470.3	34,278.2	114,748.5				

1/ Entire cost of feed for growth charged in year of slaughter (or death in case of animals dying).

Table 5 -- Feed consumption (TDN), and carcass production by year,
herd based on grading up F₁'s

(all figures in metric tons)

Year	Carcass production				TDN consumption for			
	Milk production	Bulls	2-year-old heifers	Cows	Total	Milk production and cow main- tenance	Gestation growth 1/ year	Total
1	2,000.0	104.0	0	0	104.0	1,940.0	956.0	2,896.0
2	2,025.0	84.3	8.7	14.4	107.4	1,937.2	892.5	2,829.5
3	3,321.0	121.8	7.0	14.4	143.2	2,992.1	1,232.5	4,224.6
4	4,182.5	143.2	10.2	20.2	173.6	3,672.6	1,540.7	5,213.3
5	5,548.4	179.1	12.2	24.3	215.6	4,739.2	1,955.9	6,695.1
6	7,084.8	220.7	14.7	30.8	266.2	5,931.1	2,449.1	8,380.2
7	9,027.6	269.8	18.6	37.9	326.3	7,417.0	3,046.0	10,463.0
8	11,345.1	332.1	22.9	47.9	402.9	9,173.6	3,781.9	12,955.5
9	13,036.6	405.6	27.7	144.9	578.2	10,548.6	4,800.0	15,348.6
10	16,794.1	461.0	33.8	66.0	560.8	13,030.8	5,357.3	18,388.1
11	21,200.0	572.2	38.3	83.7	694.5	16,276.1	6,642.8	22,918.9
12	25,429.3	675.8	47.9	143.6	867.3	19,282.5	8,298.1	27,580.6
13	31,016.3	815.7	56.1	156.1	1,027.9	23,282.1	9,837.7	33,119.8
14	37,390.3	971.9	67.9	196.5	1,236.3	27,812.5	11,834.6	39,647.1
15	45,143.8	1,160.6	81.1	234.0	1,475.7	33,320.0	13,913.1	47,233.1
16	52,088.6	1,384.1	96.7	286.0	1,766.8	38,383.3	16,906.3	55,289.6
17	65,116.5	1,649.0	115.4	344.6	2,109.0	47,513.7	20,184.8	67,698.5
18	77,957.0	1,962.8	137.3	415.7	2,515.8	56,657.1	24,081.9	80,793.0
19	93,339.0	2,335.1	163.7	499.8	2,998.6	67,625.8	28,704.2	96,330.0
20	111,132.7	2,777.2	194.5	600.2	3,571.9	80,340.1	34,192.1	114,532.2

1/ Entire cost of feed for growth charged in year of slaughter (or death in case of animals dying).

Table 6 -- Feed consumption (TDN), and carcass production by year,
herd based on grading up natives

(all figures in metric tons)

Year	Carcass production				TDN consumption for			
	Milk production	Bulls	2-year-old heifers	Cows	Total	Milk production and cow mainten- ance	Gestation growth 1/	Total
1	800	86.0	0	0	86.0	1,008	791.0	1,799.0
2	810	69.6	7.2	9.0	85.8	1,001.7	734.1	1,735.8
3	1,620	104.6	5.8	9.0	119.4	1,772.3	1,048.6	2,820.9
4	2,204	124.8	8.8	14.0	147.6	2,307.8	1,330.1	3,637.9
5	3,254.6	158.3	10.6	17.7	186.6	3,217.9	1,711.5	4,929.4
6	4,507.0	196.7	13.1	23.5	233.3	4,278.7	2,165.0	6,443.1
7	6,160.4	243.9	16.5	30.2	290.6	5,645.0	2,720.9	8,365.9
8	8,182.6	302.2	20.7	39.2	362.1	7,284.4	3,397.3	10,681.7
9	10,793.8	372.7	25.3	103.2	501.2	9,368.4	4,348.8	13,717.2
10	13,647.9	431.3	31.2	58.0	520.5	11,434.2	4,978.9	16,413.1
11	17,593.2	539.8	36.0	74.2	650.0	14,518.0	6,215.0	20,733.0
12	21,826.3	643.1	45.2	126.1	814.4	17,644.7	7,786.4	25,431.1
13	27,325.8	782.6	53.6	139.5	975.7	21,719.6	9,327.8	31,047.4
14	33,644.9	940.1	65.2	178.2	1,183.5	26,336.6	11,318.3	37,654.9
15	41,333.5	1,130.9	78.6	214.5	1,424.0	31,918.2	13,614.5	45,532.7
16	50,428.1	1,357.2	94.3	265.1	1,716.6	37,472.5	16,412.6	53,885.1
17	61,313.3	1,625.3	124.3	322.1	2,071.7	46,275.2	19,707.8	65,983.0
18	74,251.3	1,942.5	135.4	392.0	2,469.9	55,613.4	23,630.3	79,243.7
19	89,610.4	2,318.5	162.1	475.4	2,955.8	66,455.1	28,278.1	94,733.2
20	107,830.5	2,764.1	193.3	575.0	3,532.0	79,418.6	33,800.2	113,218.8

1/ Entire cost of feed for growth charged in year of slaughter (or death in case of animals dying).

ANNEX IV

COMMON GRAZING - A CAUTIONARY NOTE

Iranian grazing lands, both National Rangelands and pasture and range allocated to villages at the time of land reform, are to a large extent used as "commons." This old English term means used by all or used in common by all people.

The history of the use of commons as grazing land has invariably been one of overuse. Without methods for controlling grazing intensity, every livestock owner naturally keeps as many animals as possible --after all, if his animals don't eat the grass, those belonging to other owners will. The overall situation has been vividly described by Hardin in his classic paper "The Tragedy of the Commons." Seventeenth century England is the best known historically documented example of the problems of common use of grazing lands. In that country the problem was solved by "enclosing," i.e., the common land was divided into individually owned units and these enclosed or fenced. Thus, individual owners then had an incentive to limit his animal numbers to what could be adequately fed. Average productivity increased dramatically.

Enclosing or fencing individually-owned grazing plots, or indeed the individual ownership of grazing lands, usually is not economically feasible in low rainfall areas where production of forages per ha. is low. In these cases, public or "common" ownership coupled with a government-operated permit and fee system has proven successful in controlling grazing intensity. Ranges are maintained or improved and animal productivity maximized by these systems.

Permit and fee systems for utilization of publicly-owned grazing land are not easy to operate. The problems of who will be issued permits, and for how many animals, usually have been solved initially on the basis of historical use patterns and ownership of adjacent land with subsequent adjustments based on trends in range condition.

Fee levels are equally difficult to determine but should be set at levels sufficient to cover administrative costs of the over-all program with consideration given to fee levels in relation to costs of feed which would be needed to maintain the same numbers of animals at the same productive levels.

For Iran's National Rangelands a permit system already has been initiated but thus far covers only a small fraction of the country and has been only partially effective in the areas covered. Our suggestion for these lands is for full implementation of the existing program with all possible speed. This program should have the highest priority. The program should be continually under review with modifications made as experience dictates. We believe a fee system should be incorporated into the program at an early date.

For village grazing lands, a quota system for total number of animals owned seems the only practical solution to the problem. A program for establishing and maintaining quotas coupled with genetic improvement and effective use of supplemental feeds is proposed elsewhere in this report. We believe its implementation should have a high priority equal to that given the permit and fee systems for National Rangelands.

